VAXstation 3100

digital

Maintenance Guide

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VS 3100 Maintenance Guide

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About This Manual

This guide describes how to troubleshoot, adjust, and repair the VAXstation 3100 to the field replaceable unit (FRU) level. It covers all FRU options presently available for model 30 (VS42A-xx) and model 40 (VS42S-xx) versions of the VS 3100 system. The label on the rear of the system box indicates the system you are working on (VS42A-xx or VS42S-xx).

Organization

This guide has seven chapters and eight appendixes.

- Chapter 1 contains testing procedures: power-up test, self-test, and system exerciser tests.
- Chapter 2 contains troubleshooting procedures to help isolate the problem to an FRU.
- Chapter 3 contains a description of the utilities.
- Chapter 4 describes the model 30 system: a system overview, FRU removal and replacement procedures, and description of options.
- Chapter 5 describes the model 40 system: a system overview, FRU removal and replacement procedures, and description of options.
- Chapter 6 describes the VAXstation 3100 expansion boxes: an enclosure overview, troubleshooting information, and FRU removal and replacement procedures.
- Chapter 7 contains operating information: booting and removable media drives operating information.
- Appendix A lists the test commands.
- Appendix B lists the console commands and definitions.
- Appendix C lists the console messages and definitions.
- Appendix D lists the VMB boot error status codes and VMB definitions.
- Appendix E lists the power-up and self-test error codes.
- Appendix F lists the system exerciser error codes.

- Appendix G lists the definitions of the LEDs on the back of the system box.
- Appendix H lists the recommended spares list (RSL).

Intended Audience

This document is only for Digital Field Service personnel and self-maintenance customers.

Tools and Equipment

You need the following tools to service the VAXstation 3100 systems.

Tools and Equipment	Part Number
Wrist strap and antistatic mat (included in Field Service antistatic kit)	29-26246-00

Conventions

This document uses the following conventions:

Convention	Meaning
Note	Provides general information you should be aware of.
PN	Indicates a part number.
Return	Text within a box identifies a key, such as the Return key.
>>>	Indicates a console prompt.
Bold text	Bold print identifies user input. This is particularly used in examples and system displays.
⟨x:y⟩	Represents a bit field, a set of lines, or signals, ranging from x through y. For example, R0 ⟨7:4⟩ indicates bits y through 4 in general purpose register R0.
SHOW QUEUE	Names of commands in text are shown in uppercase.
Ctrl C	For sequences that use the Ctrl key, hold down Ctrl and press the second key.
`VSmv_RES_Svec`	Examples of commands or other text you enter on the keyboard are shown in monospace type.

Related Documents

You can order the following documents from Digital. This guide refers to many of these documents.

Table 1 Related Documents

Documents	Order Number
VS 3100 Model 40 Customer Information Kit	EK-VS310-IL
Managing your VS 3100 Model 30 Standalone	EK-260AA-OM
VS 3100 Hardware Information Model 30	EK-265AA-OM
VS 3100 Hardware Information Model 40	EK-266AA-OM
Using Your VS 3100 Model 30 Satellite	EK-259AA-UG
VR290 Service Guide	EK-VR290-SV
VR150 Pocket Service Guide	EK-VR150-PS
VR160 Pocket Service Guide	EK-VR160-PS
VAXstation 2000, MicroVAX 2000, VAXmate Network Guide	EK-NETAB-UG
TZK50/SCSI Controller Technical Manual	EK-TZK50-TM

Digital personnel may order these documents from:

Digital Equipment Corporation
44 Whitney Street
Northboro, MA 01532

Attn: Publishing and Circulation Services (NRO3/W3)
Order Processing Section

1
Testing

This chapter describes how to test the VAXstation 3100 (VS 3100) model 30 and model 40 systems. Testing procedures on both models are similar and any differences between them are specifically identified in the text. The label on the back of the system box indicates which model you are working on. The VS42A-xx model number on the label identifies the model 30 system and the VS42S-xx model number identifies the model 40 system.

All testing is done while in console mode and diagnostic tests are ROM-based.

This chapter contains the following sections:

- Using console mode
- Running power-up testing
- Running self-tests
- Running system exerciser diagnostics

1.1 Using Console Mode

The VS 3100 system has two modes of operation: program mode and console mode. Program mode is when the operating system (for example, VMS or ULTRIX) is controlling the system. Console mode allows the user to control the system from the console terminal using the console commands described in Appendix B. Console mode is contained in ROM on the system module.

Testing is done while in console mode. The system returns the console prompt >>> when it is in console mode. Table 1–1 lists the prompts and the mode of operation each prompt represents.

Table 1–1 Prompts

Prompt	Mode of operation
>>>	Console mode. Console commands are listed in Appendix B.
$	Program mode (VMS operating system)
%	Program mode (Ultrix operating system)

1.1.1 Determining the Console Device

The console device is the keyboard (LK201) and the monitor (VR150/VR260 monochrome or VR160/VR290 color) connected to the video port. The keyboard inputs commands at 4800 baud and the monitor displays output from the video circuits (base video or 8-plane graphics module).

An alternate console can be used on the model 40 system. A terminal (VT100 series and VT220 series) can be connected to the printer port. The S3 on the back of the system box must be in the up position. The S3 must be in the up position before the system is powered up or the monitor is still the console. When the system is powered up, the terminal is the console. The terminal must be set at 9600 baud, with 8 bits, and no parity. Model 30 does not allow access to the S3 since it is covered by the rear bezel (future model 30s may allow access). However, model 30 uses this alternate console if you open the system box and move the S3 on the system module to the up position.

1.1.2 Entering Console Mode

Console mode is entered any time the CPU halts. A halt means that control has passed from the operating system software to the console mode program in ROM. The CPU can be halted automatically or manually. When halted automatically (boot failure, major system error, or after power-up testing), the console mode program checks the nonvolatile RAM for user-defined instructions (restart, boot, or halt). The system then executes the instructions. The CPU is halted manually by pressing the halt button on the back of the system box and the system enters console mode immediately.

To enter console mode, have the system manager shut down the operating system software, then press the halt button.

1.1.3 Exiting Console Mode

To exit console mode, type one of the following console commands. These commands are further described in Appendix B.

- BOOT—This command initializes the CPU and boots the operating system software from the device specified. If no device is specified, the system uses the default device in NVR. If no device is listed in NVR, the system defaults to the Ethernet (ESA0) as the boot device.

  The BOOT command starts the system similar to when power is turned on except that the power-up tests are not run. If the system attempts to boot over the Ethernet (ESA0) and no response is received, make sure the node with the operating system software is operating normally and the software is loaded. Press the halt button if you need to abort the Ethernet boot.

- CONTINUE—This command instructs the CPU to continue the operating system software at the address contained in the program counter (PC). This command starts up the operating software where it was halted provided no console TEST commands were run. Running a TEST command alters the PC register and memory so that the operating system software cannot be started properly by entering the CONTINUE command. If a TEST command was entered, use the BOOT command to start the operating system software.

- START—This command starts the operating system software at a specified address. If no address is given, the contents of the PC register are used. However, running a TEST command alters the PC register and memory so that the operating system software cannot be started properly by entering the START command. If a TEST command was entered, use the BOOT command to start the operating system software.

1.2 Running Power-Up Tests

Power-up tests run each time the system power is turned on and, if the tests are successful, the operating system starts booting. Power-up testing consists of a sequence of tests executed for each device installed in the system. The test number of each device is listed on the power-up screen display as the device is tested. LEDs on the rear of the system box indicate the status of the system as it is powered up. Appendix G lists the definitions of the LEDs if you need them.

Figure 1–1 shows an example of the power-up screen display. The first line indicates the CPU name (KA42-A) and the ROM version (V1.0 or higher). The test numbers (in hexadecimal) are listed next in descending order from the first test, F, to the final test, 1. Note in Figure 1–1 that TESTS 4, 3, and 2 have an underscore (_) immediately after them (TESTS 7 and 6 have diskless systems). This underscore (_) indicates that no option device is installed or tested; so, no option tests are done.

```
KA42-A V1.0

F...E...D...C...B...A...9...8...7...6...5...4_..3_..2_..1...
```

Figure 1–1 Power-Up Tests Screen Display

An asterisk (*) after TESTS 7, 6, or 4 through 2 indicate that an option is installed, but its ROM is destroyed and the option device must be replaced. Only TESTS 7, 6, or 4 through 2 can have an * after them. Table 1–2 lists the symbols that appear in between the tests and what they indicate.

Table 1–2 Power-Up Symbols Defined

...	Device tested successfully or it may have a soft error.
?..	Device has a hard error.
_..	Option device not installed or device not tested.
*..	Option device installed, but its ROM code has not been executed.

If any hard errors (errors that indicate the device must be replaced for proper operation) are found during power-up testing, a question mark (?) is placed after the failing test number during the countdown sequence. Note that soft errors do not put a ? after the failing test number during the countdown sequence.

Figure 1–2 shows the power-up screen display with a hard error found in TEST F and a soft error found in TEST E. A summary of all the errors detected is listed after the power-up sequence is complete and is displayed before the boot sequence is started. In the power-up summary, two question marks (??) indicate a hard error and one ? indicates a soft error or a status for that device.

As shown in Figure 1–2, the power-up summary consists of ? or ??, a test number, the ID number of the failed device, and an eight-digit code. For example, in Figure 1–2, the first line of the power-up summary shows a hard error for TEST F, a device ID number of 00B0, and a code of 0001.F002. The second line shows a soft error for TEST E, a device ID of 0040, and a code of 0000.0005. The device tested by TEST F must be replaced, but the device tested by TEST E only indicates a status code and does not have to

be replaced. When you are not sure whether a device needs replacing or not, refer to the troubleshooting section for that device in Chapter 2.

```
KA42-A V1.0

F?..E...D...C...B...A...9...8...7...6...5...4_..3_..2_..1...

?? F    00B0   0001.F002      (Hard error)
 ? E    0040   0000.0005      (Soft error)
```

Figure 1–2 Example of Power-Up Tests with Errors

Usually, a ? in the power-up summary indicates a minor problem and the system may be usable without replacing any FRUs. A ?? in the power-up summary indicates a hard error. This indicates a serious problem that may affect normal operation and use of some component in the system. The failing device must be replaced before booting the operating system software.

You should always display the configuration table (enter **TEST 50**) after power-up tests to be sure all of the devices in the system are listed (on-line). If, for instance, a disk drive is installed but its power connector becomes unplugged, the tests would not show an error during testing. The system boots automatically. You have to stop the booting process by pressing the halt button and check the status of all devices in the system. You should be familiar with the good status codes for each device listed in the configuration table and know when a drive's status code shows it to be off-line when it really should be on-line.

If the monitor screen remains blank for more than 5 minutes after the power is switched on, there may be a problem with the monitor, the video cable or the system. Check the LEDs on the back of the system box or on the keyboard to determine if the system has failed. If the system is normal, check the monitor and cable. Appendix G contains the definitions of the LEDs on the back of the system box. Table 1–3 lists the failing module indicated by the LEDs on the keyboard.

Table 1–3 Keyboard LEDs Defined

Keyboard LED	Failing Module
Hold Screen	System module
Lock	Option module (8-plane graphics)
Compose	Ethernet circuits on system module
Wait	Not used

1.2.1 Power-Up Test Codes

The power-up test codes indicate no error, soft errors, status information, or hard (fatal) error information. Any errors found by power-up tests are listed in the power-up tests summary. These errors as well as the status of all devices installed in the system are then stored in the configuration table (TEST 50).

Table 1–4 lists the test numbers and the devices that are tested during that particular test. To look at the status of a device, display the configuration table (enter **TEST 50 (T 50)** at the console prompt >>>). The configuration table lists every device in the system and also lists the results of the power-up tests and self-test. It is updated each time self-test is run. Remember that the configuration table contains the results of the power-up tests and self-test and not the results of the system exerciser.

Table 1–4 Power-Up and Self-Test Commands

Test	Mnemonics	Device
T F	MONO	Base video
T E	CLK	Time-of-year clock
T D	NVR	Nonvolatile random access memory (RAM)
T C	DZ	Serial line controller
T B	MEM	Memory
T A	MM	Memory management unit
T 9	FP	Floating point unit
T 8	IT	Interval timer
T 7	STRG-1	RX23 diskette drive (model 30 with ST506/SCSI)
T 7	SCSI-A	SCSI-A bus controller on the SCSI/SCSI MSC module
T 6	SCSI-B	SCSI-B bus controller on the SCSI/SCSI MSC module
T 6 and 7	SCSI-A and SCSI-B	RZ22 and RZ23 disk drives
T 6	SCSI-A and SCSI-B	RRD40 compact disc and adapter board
T 6	SCSI-A and SCSI-B	RZ55 expansion box

Table 1–4 (Cont.) Power-Up and Self-Test Commands

Test	Mnemonics	Device
T 6	SCSI-A and SCSI-B	TK50Z-GA expansion box
T 6	SCSI-A and SCSI-B	RRD40 expansion box
T 5	SYS	Interrupt controller and Ethernet ID ROM
T 4	8PLN	Option module (8-plane graphics module)
T 3		Option module (not available)
T 2		Option module (not available)
T 1	NI	Ethernet circuits

Figure 1–3 shows an example of the configuration table. The model 30 system may contain a device called STRG-1 instead of the SCSI-B device. This STRG-1 device is for the RX23 diskette drive. Later versions of the RX23 drive eliminate the need for STRG-1 and the RX23 drive will be included on the SCSI-A or SCSI-B devices.

If you are not sure whether the system is model 30 or model 40, check the label on the back of the system box. Model 30 is listed as a VS42A-xx system and model 40 is listed as a VS42S-xx system.

```
>>> TEST 50
 KA42-A V1.0
 ID 08-00-2B-02-CF-A4

  MONO        0000.0001
  CLK         0000.0001
  NVR         0000.0001
  DZ          0000.0001
     00000001 00000001 00000001 00000001 00000001 000012A0
  MEM         0008.0001
     00800000
  MM          0000.0001
  FP          0000.0001
  IT          0000.0001
  SCSI-A      0808.0001 V1.0
     FFFFFF05 FFFFFF05 FFFFFF05 00000001 FFFFFF05 FFFFFF05 FFFFFF03
  SCSI-B      3C3C.0001 V1.0
     FFFFFF05 FFFFFF05 00000001 00000001 05000001 01000001 FFFFFF03
  SYS         0000.0000
  8PLN        0000.0001 V1.0
  NI          0000.0001

>>>
```

Figure 1–3 Configuration Table (T 50)

Figure 1–4 shows an example of the model 30 system's configuration table when an RX23 diskette drive is installed.

```
>>> TEST 50

 KA42-A V1.0
 ID 08-00-2B-02-CF-A4

  MONO        0000.0001
  CLK         0000.0001
  NVR         0000.0001
  DZ          0000.0001
     00000001 00000001 00000001 00000001 00000001 000012A0
  MEM         0008.0001
     00800000
  MM          0000.0001
  FP          0000.0001
  IT          0000.0001
  STRG-1      7177.0001 V1.0
     00000000 00000000 00000960 00000000
  SCSI-A      0808.0001 V1.0
     FFFFFF05 FFFFFF05 FFFFFF05 00000001 FFFFFF05 FFFFFF05 FFFFFF03
  SYS         0000.0000
  8PLN        0000.0001 V1.0
  NI          0000.0001

>>>
```

Figure 1–4 Model 30 System Configuration Table with RX23 Drive

Any code in the configuration table other than 0000.0001 on the MONO, DZ, MM, FP, IT, or SYS devices indicates a hard error and the system module must be replaced for proper operation of the system. The other devices such as CLK, NVR, MEM, STRG-1, SCSI-A, SCSI-B, and NI may have a code other than (0000.0001) and may still operate normally. Go to the device's troubleshooting section in Chapter 2 to determine whether or not the device's code indicates a fault or a status for the device. Refer to Section 3.1 if you need an explanation of how to read the configuration table. Refer to Appendix E if you need a detailed listing of the power-up error codes.

Since a ? could indicate status information, some common power-up status messages are defined as follows:

- Clock not set — ? E 0040 0000.0005

  This message indicates that the system clock has not been set. Setting the clock is part of the operating system software installation and cannot be set while in console mode. Once the clock is set, this code will be cleared the next time the clock circuits are tested.

- Low battery — ? D 0050 0000.0005

This message indicates that the battery's charge is low which may be the case when a system is first installed. Run the system for about 17 hours to fully recharge the battery.

- No Ethernet cable (ThinWire) — ?? 1 00C0 0000.7004

  This message indicates that the ThinWire Ethernet connector on the back of the system is not terminated or that the Thinwire Ethernet cable is not terminated properly.

- No Ethernet cable (standard) — ?? 1 00C0 0011.700E

  This message indicates that the standard Ethernet connector on the back of the system is not terminated or that the standard Ethernet cable is not terminated properly.

- No heartbeat on standard Ethernet — 1 00C0 0100.0001

  This message indicates that the standard Ethernet is selected and terminated properly, but the Ethernet network is not supplying the necessary heartbeat signals to the system. This is normal if just the loopback connector is installed on the standard Ethernet connector.

- Graphics module — ? 4 00D0 XXXX.0213

  This message indicates that the two 75 ohm video cable terminators are not installed on the color video cable's red and blue connectors when using a monochrome monitor.

1.3 Running Self-Test

Self-test allows you to test every device again after power-up tests are complete. Devices can be tested individually (except for drives), a few at a time, or all of them sequentially just like power-up tests.

1.3.1 Self-Test Diagnostic Commands

To individually test a device (drives are tested all together on their particular bus), enter the (**TEST** or just (**T**), followed by a space and the test number of the device you want tested. Table 1–4 lists the devices and the test numbers that test them. Figure 1–5 shows an example of running self-test on an SCSI bus. All devices connected to the SCSI bus are tested and the results are listed in the configuration table (TEST 50).

```
>>> TEST 6
  6...
>>>

  NOTE: Enter TEST 50 to see the results
```

Figure 1–5 Example of Running Self-Test on a SCSI Bus

To test a group of devices, enter **TEST** followed by the test number of the first device to be tested and then the test number of the last device to be tested. For example, entering **TEST C 4** tests all tests between C and 4. Note that you cannot select which devices to test between C and 4. All tests between C and 4 are tested when entered as a group. To test all devices, enter **TEST F 1**. To repeat a test over and over again without reentering it, enter **Repeat TEST x**.

1.3.2 Mass Storage Controller (MSC) Module Differences

The model 30 system supports two different MSC modules (only one can be installed at the same time). The SCSI/SCSI MSC module contains two SCSI buses (SCSI-A and SCSI-B) and the ST506/SCSI MSC module contains one SCSI bus (SCSI-A) and one bus for the RX23 diskette drive (STRG-1). This ST506/SCSI MSC module will be replaced by the SCSI/SCSI MSC module once an additional adapter module is available for the RX23 diskette drive. This adapter module interfaces the RX23 onto one of the SCSI buses on the SCSI/SCSI MSC module. Until the adapter module is available, diagnostics on the RX23 diskette drive are run through the STRG-1 device by entering **TEST 7**.

1.3.3 Self-Test with Loopback Connectors

Customer mode self-test (that is, without any serial line loopbacks) does not test the drivers on the serial lines (DZ). To test the DZ drivers, run self-test on the serial lines in Field Service mode by installing loopbacks on the two MMJ connectors, then run TEST C. Display the configuration table to see the results.

If only one MMJ loopback is available, install it in the communications port and run the tests. An error code of 0000.0200 for the DZ indicates that the printer port does not have the loopback installed, but the communications port tested successfully.

NOTE

The ThinWire Ethernet port or the standard Ethernet port (depending on which port the customer is using) on the back of the system box must be terminated properly when running diagnostics on the Ethernet circuits (TEST 1). Otherwise an error code of 0000.7001 or greater is listed in the configuration table.

1.3.4 Self-Test Codes

If an error is detected during self-test, a ? is put next to the test number and a failure message (84 FAIL) is displayed. You must display the configuration table (enter **TEST 50**) after self-test is complete to see the error code. The configuration table lists every device in the system, lists the results of the self-test and power-up tests, and is updated each time self-test is run. Remember that the configuration table contains the results of the self-test and power-up tests and not the results of the system exerciser. Go to the device's troubleshooting section in Chapter 2 to determine whether or not the device's code indicates a fault or a status for the device. See Section 3.1 if you need an explanation of the configuration table. Refer to Appendix E if you need more information on self-test error codes.

1.4 Running System Exerciser Diagnostics

The system exerciser simulates a worst-case operating system situation test for each device and checks how the device operates under these conditions. This type of testing usually finds any interactive problems.

The system exerciser exercises most of the devices. However, some devices such as the memory management unit (MM) and the interval timer (IT) are tested through the testing of other devices and are not displayed. Of the devices the exerciser does exercise, it runs each one sequentially until all have been run once, then it runs them concurrently.

To run the Field Service mode system exerciser, install a loopback on the communication port, insert and load the special-keyed test diskette, compact test disc, and tape cartridge[1] (if the system has these devices installed). To run the exerciser, enter **TEST 101**, **TEST 102**, or **TEST 80000106**. TEST 80000106 allows you to enter the test number of the individual devices you want to run the exerciser on. If the diskette or the tape drive are not loaded with the special-key media, the system exerciser does not do destructive writes to them and tests them the same way as it does during the customer mode system exerciser. If the compact disc drive is not loaded with the test disc,

[1] This special key on the media prevents the exerciser from accidentally destroying data on the customer's diskette or tape cartridge. The compact disc never does write.

the drive does not perform any reads. If the test disc is not available, any disc loaded allows the exerciser to perform reads but does not check the error correction circuits (ECC). Refer to Section 3.17 if you need information on creating the special diagnostic keys on the diskette and tape.

The test numbers and mnemonics used for the system exerciser are the same as the test numbers and mnemonics used by self-test (Table 1–4).

1.4.1 System Exerciser Diagnostic Commands

Table 1–5 lists the system exerciser diagnostic commands. When running TEST 0 or TEST 101, the exerciser automatically stops after about 5 minutes and the halt message (06 HLT INST) is displayed. This halt message is normal for these two tests.

Table 1–5 System Exerciser Diagnostic Commands

Test	Description of Commands
T 0	Runs customer mode system exerciser. No loopback connectors and no removable media are required. It exercises each device once sequentially, then exercises them simultaneously, and stops when the slowest device finishes (about 5 minutes).
T 101	Runs Field Service mode system exerciser. Loopbacks and removable media are required. It exercises each device once sequentially, then exercises them simultaneously, and stops when the slowest device finishes (about 5 to 8 minutes). Do not stop the exerciser before it is finished.
T 102	Runs Field Service mode system exerciser. Loopbacks and removable media are required. It exercises each device once sequentially and then exercises them simultaneously until you press Ctrl C to terminate the tests. Once the test are terminated, an extended summary for some of the tests can be displayed by pressing Return. Continue pressing Return to display more extended summaries. Press Ctrl C a second time to terminate the extended summary and return control to the console prompt >>>. Note that the exerciser takes up to 30 seconds to stop after you press Ctrl C. Do not stop the exerciser until every device is exercised twice (second pass). Also, do not press the halt button to stop the exerciser.

Table 1–5 (Cont.) System Exerciser Diagnostic Commands

Test	Description of Commands
T 80000106	Individual device testing. Loopbacks and removable media are required. Runs system exerciser diagnostics on individual devices (TEST 6 and TEST 7 are considered individual devices even though they test several drives). This test allows you to test individual devices by entering the test number of the device at a second prompt. This individual testing saves time since you do not have to wait for all of the other devices to finish testing.

When the exerciser is started, PRA0 is displayed until the graphics circuits start testing and the monitor flashes several times. The test results of the first device are then displayed. The rest of the devices are then exercised one at a time and the results are listed in the display. When the last device is finished with its first test, the screen flashes again while the exerciser starts testing all devices together at the same time. The results of all the tests are then displayed for a short time before the exerciser starts running all devices together again.

If TEST 0 or TEST 101 is entered, the exerciser stops after the last device is done testing. The test results are displayed on the screen and a halt message is displayed (06 HLT INST).

If TEST 102 or TEST 80000106 is entered, the exerciser continues testing until you press Ctrl C.

1.4.2 System Exerciser Codes

The system exerciser displays the status of the devices on the screen as the exerciser is running. Any errors found are displayed in the exerciser display. When examining the exerciser display, a ? in the far left column indicates a soft error, a ?? indicates a hard error, and the absence of question marks usually indicates success. There may be times when there are no question marks, but a drive may not be listed in the display (for example, an unplugged power cable). In these instances, you need to be familiar with the codes of all devices so that when you examine the display, you know if a specific drive or device is listed and if the drive or device has a fault.

Figure 1–6 shows an example of the system exerciser display while running the system exerciser in Field Service mode. Customer mode gives the same display, but with a CU (customer mode) in place of the FS (Field Service mode) on the top of the display.

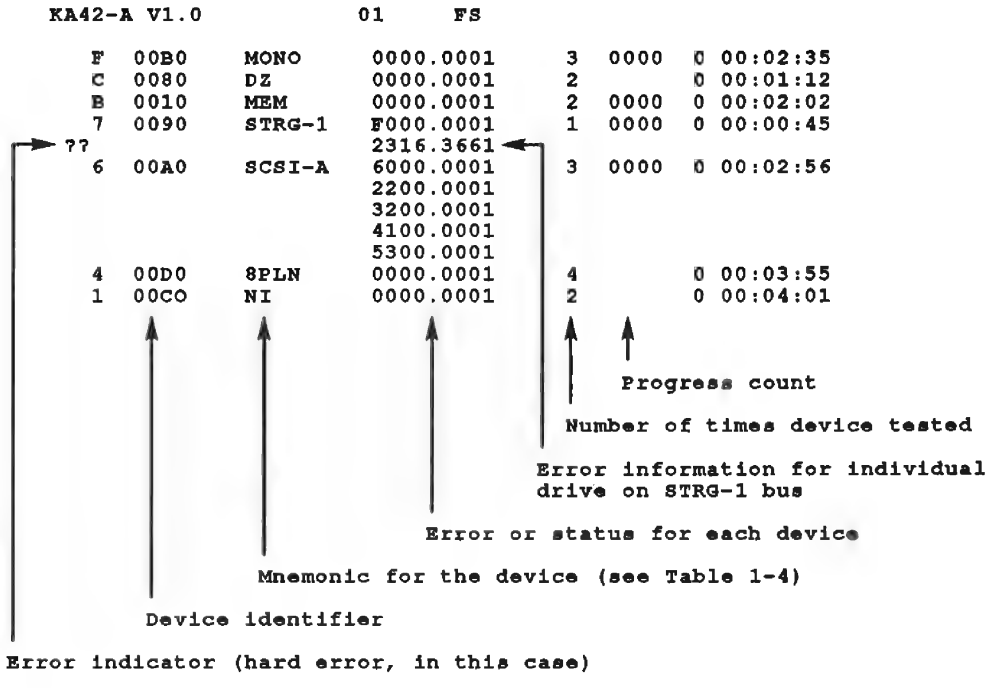


Figure 1–6 System Exerciser Display Example

The first line indicates the CPU name (KA42-A), the ROM version (V1.0), the ROM status (01 — if not 01, the ROM is corrupted and the system module must be replaced), and the mode of the system exerciser (CU for customer and FS for Field Service mode). The next several lines list information on the devices that are exercised by the system exerciser.

The first column of the display lists the test number (F,C,B,7,6,4,1). TESTS 7, 6, and 4 through 2 are option modules and are listed in the display only if they are installed. The second column lists the device identifier (00B0, 0080, 0010, and so on.). Next is the mnemonic for each device (MONO, DZ, MEM, and so on.) followed by the code (0000.0000) for that device. Note that the STRG-1, SCSI-A, and SCSI-B devices have additional codes for each drive that is installed. After the codes is the number of times the device was tested followed by the progress count (available on some devices) and then the time of the last pass the exerciser made on that device. The time is in the format of days hours:minutes:seconds. Two question marks (??) identify hard errors and a single question mark (?) identifies soft errors.

A ? in the far left column indicates a soft error, ?? indicate a hard error, and the absence of question marks usually indicates success. If an error is indicated, go to the device's troubleshooting section in Chapter 2 to determine whether or not the device must be replaced for normal operation. Refer to Appendix F if you need additional information on the error codes.

Some devices display the progress count which indicates the progression of the test for that device. At the beginning of each test pass, the progress count is again initialized to zero.

1.4.3 Extended Summary Reporting

Extended summaries are available only when running the system exerciser in Field Service mode. When running TEST 101, extended summaries are available when the testing automatically stops after the second pass. When running TEST 102, extended summaries are available when you halt the tests by pressing Ctrl C after the second pass of the test is complete. When running TEST 80000106, extended summaries are not available but you can display the results of the tests once again by pressing the halt button after the second pass of the test is complete and entering **SHOW ESTAT** at the console prompt >>>. Extended summaries contain additional error information on some of the devices run by the exerciser. Press Return to display the first extended summary. Continue pressing Return to display all of the extended summaries until you return to the exerciser display. Enter a second Ctrl C to halt the extended summaries and return to the console prompt >>>. Press Return to stop the extended summary for the SHOW ESTAT command. The halt message is displayed when the exerciser is stopped and control is returned to the console. Figure 1–7 shows an example of the extended summary for the SCSI-B device and Figure 1–8 show an example for the STRG-1 device.

```
KA42-A   V1.0              01              FS
******** SCSI-B                  STM_SUMM              0 00:05:57 ******

      adr          rds          wts          xfs          xferr          sde
      ---          ---          ---          ---          ---            ---

      003          008          000          157          000            1
      004          008          000          073          000            1
      005          008          004          023          000            1

********* STM_TYPE_ANYTHING
```

Figure 1–7 Example of SCSI-B Extended Summary Report

The adr is the SCSI address ID of a drive, rds is the number of reads performed on that drive, wts is the number of writes performed on that drive, xfs is the number of data transfers performed on that drive, and xferr is the number of transfer errors on that drive.

```
KA42-A   V1.0              01              FS
******** STRG-1                  STM_SUMM              0 00:03:23 ******

        adr          rds          wts          serr          herr
        ---          ---          ---          ---           ---

        002          003          003          000           000

********* STM_TYPE_ANYTHING **********************************
```

Figure 1–8 Example of STRG-1 Extended Summary Report

The adr is the address of the RX23 drive (002 for DUA2), rds is the number of reads performed on the drive, wts is the number of writes performed on the drive, serr is the number of soft errors detected, and herr is the number of hard errors detected.

To display the extended summaries once again after exiting the system exerciser, enter **SHOW ESTAT**. SHOW ESTAT brings up extended summary information from the last time you ran the Field Service system exerciser.

2
Troubleshooting

This chapter contains information for troubleshooting the VS 3100 model 30 and model 40 systems. The label on the back of the system box indicates which model you are working on. The VS42A-xx model number on the label identifies model 30 and the VS42S-xx model number identifies model 40 systems. All procedures in this chapter apply to both system models unless specifically listed in the section titles or as described in the text. Also, all troubleshooting procedures are done while in console mode (operating system software halted).

2.1 Troubleshooting Procedures

If you already know which device in the system has a fault then proceed to Table 2–1 to locate the device you need to troubleshoot. If you think there is a problem with the system but are not sure which, if any, device is faulty, run the diagnostics (self-test or system exerciser) as described in Chapter 1. Then return here and locate the faulty device in Table 2–1.

Table 2–1 Troubleshooting Procedures

Failing Test	Device	Section
F	MONO	2.3
E	CLK	2.4
D	NVR	2.5
C	DZ	2.6
B	MEM	2.7
A	MM	2.8
9	FP	2.9
8	IT	2.10
7	STRG-1 (RX23 with ST506/SCSI)	2.11
7	SCSI-A (SCSI/SCSI MSC module)	2.12
6 or 7	RZ22 or RZ23 disk drive	2.17
6 or 7	TZ30 tape drive	2.16
6	RRD40 compact disc drive	2.18
6	RZ55 disk expansion box	6.1.1
6	SCSI-A (model 30 with ST506/SCSI)	2.13
6	SCSI-B (SCSI/SCSI MSC module)	2.14
6	TK50Z expansion box	6.3.1
6	RZ55 expansion box	6.1.1
6	RRD40 expansion box	6.2.1
5	SYS	2.19
4	8PLN	2.20
1	NI	2.21
	No Video Display	2.2

2.2 No Monitor Display

Figure 2–1 shows the normal sequence of events during power-up. If no video is displayed on the console screen during power-up, refer to Section 2.2.1 to troubleshoot a nonoperating/no video output problem.

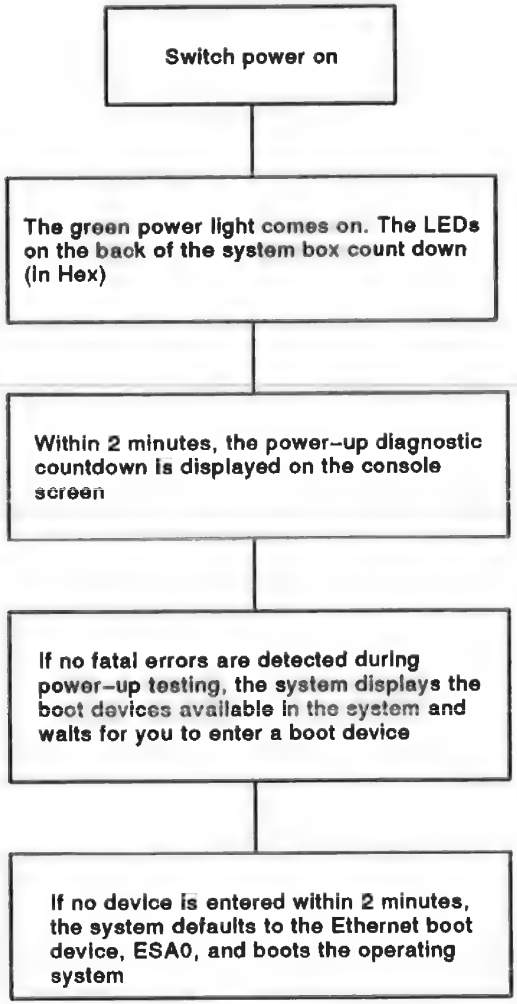


Figure 2–1 Normal System Power-Up Flowchart

2.2.1 Troubleshooting Procedure for No Video Display

Each step in this troubleshooting procedure instructs you to disconnect a FRU, power-up the system, and determine if the problem still exists. Each step describes a different FRU to disconnect. You must disconnect an FRU as described in each step until the system powers-up normally. Once the system powers-up normally, the last FRU you disconnected is the failing FRU. Replace the failing FRU and retest the system for any further problems.

1. Check the video cable for a good connection on the monitor and on the system box. Make sure the monitor is switched on. The LED on the monitor should be lit when power is supplied. Turn up the brightness control until raster is observed. If no raster appears on the screen, refer to the monitors pocket service guide to check the video monitor.

2. Power down the system. Check the position of [S3] on the back of the system box. It should be in the down position if the monitor is used as the console device. It should be in the up position if a terminal is used as the console device (the terminal should be connected to the printer port).

3. Remove the system box cover, disconnect the MSC cable betwen the system module to the MSC module, and disconnect the power cables to the drives. This disconnects the MSC module and all of the drives from the system.

4. Power up the system with the MSC module and all drives disconnected. If the system still has no video display, the problem is not with the drives or the MSC module, proceed to step 4. If the system has a video display after disconnecting the MSC module and the drives, power down the system, reconnect the MSC module and then power up the system again. If the system has no video display again, replace the MSC module and retest the system. If the system has no video display after reconnecting the MSC module, plug in the drives one at a time until the system fails. Replace the drive that prevented no video display.

5. Power down the system, remove drive mounting panel(s) from the system, and remove the graphics module from the system module. If the graphics module was not installed, proceed to step 6. When you power up the system after removing the graphics module, you must either connect an alternate console terminal to the printer port and set the [S3] to the up position (9600 baud rate) or watch the LEDs to see if the system has a video display or not. The alternate console is used because when the graphics module is disconnected, the monitor is disabled.

6. Power up the system with the graphics module disconnected. If the system has no video display, the problem is not in the graphics module, power down the system and proceed to step 6. If the system has a video display, replace the graphics module and retest the system.

7. Remove the memory module from the system module.
8. Power up the system with the memory module disconnected. If the system has no video display, the problem is not the memory module, proceed to step 8. If the system has a video display, replace the memory module and retest the system.
9. Power down the system. Replace the system module and power up the system again. If the system still has no video display after replacing the system module, replace the power supply.

2.2.2 Additional Information on Nonoperating Systems

When a monochrome monitor is used with a graphics module installed (BC19S video cable is used), a 75-ohm terminator (PN 29-26899-00) must be connected on the red and blue leads of the video cable when testing the graphics option (TEST 4). The green lead is plugged into the video input connector on the monochrome monitors. Appendix E contains the power-up and self-test error codes and Appendix F contains the system exerciser error codes.

2.3 TEST F — MONO — Monochrome Video Circuits

The system module contains the monochrome video circuitry necessary to support graphics displays on a monitor when an 8-plane graphics module is not installed. This section descibes how to test these monochrome circuits on the system module. This procedure does not troubleshoot the video monitor or the 8-plane graphics module. The system module must be replaced whenever any error (soft or hard) is detected on the monochrome circuits.

Self-test and the system exerciser are used to troubleshoot the monochrome video circuits. Enter **TEST F** to run self-test. Then enter **TEST 50** to see the results or enter **TEST 0** for customer mode system exerciser.

A code of 0000.0001 next to the MONO mnemonic indicates no errors detected with the monochrome circuits. Replace the system module if any other code is listed.

2.3.1 Additional MONO Information

The monochrome video circuits on the system module are disabled when a graphics module is installed. If the system detects a hard error on the graphics module, then the system reenables the monochrome circuits as a backup video display and disables the graphics module's output. However, since the monochrome circuits output signals through the BC18P video cable instead of the BC19S cable the graphics module uses, the screen remains blank. Check if the lock LED on the keyboard is lit. If so, replace the graphics module to fix the problem. You can have a display on the monitor until the problem is fixed by changing the video cable from a BC19S to a BC18P temporarily.

Appendix E contains the power-up and self-test error codes and Appendix F contains the system exerciser error codes.

2.4 TEST E — CLK — Time-of-Year Clock

The time-of-year (TOY) clock controls the system date and time. The date and time cannot be set while the system is in console mode. Therefore, the code for the TOY clock should always indicate a soft error (0000.0005 - clock not set) when the system is first powered on after replacing a system module or the battery or before the operating system software is installed.

Self-test is used to troubleshoot the time-of-year clock circuits. The system exerciser does not test the TOY clock circuits. Enter **TEST E** to run self-test.

A code of 0000.0001 next to the CLK mnemonic indicates no errors detected with the clock circuits. Replace the system module if any other code is listed (except 0000.0005 as previously described).

2.4.1 Additional CLK Information

The operating system (VMS or ULTRIX) sets the date and time. Refer to the operating system documentation to set the time.

The TOY clock is located on the system module. Therefore, the system module must be replaced whenever the clock shows an error other than the clock not set error.

Appendix E contains the power-up and self-test error codes.

2.5 TEST D — NVR — Nonvolatile RAM

The nonvolatile RAM (NVR) contains specified data that must not be lost when the system is powered down. It stores boot device information, boot flag information, the keyboard language, the time and date, the charge status of the battery, and other information. Since the battery charge may be low before the initial installation of the system, the NVR may show a soft error code of 0000.0005 indicating that the battery needs to be recharged.

Self-test is used to troubleshoot the NVR circuits. The system exerciser does not test the NVR circuits. Enter **TEST D** to run self-test.

A code of 0000.0001 next to the NVR mnemonic indicates no errors detected with the NVR circuits. Replace the system module if any other code is listed (except 0000.0005 as previously described).

2.5.1 Additional NVR Information

The NVR circuits are located on the system module. Therefore, any error code for the NVR, except the low battery charge code (0000.0005 - low battery) indicates that the system module must be replaced. If the low battery charge code does not clear within 1 hour of constant power-on operation, check the battery cable connection. Then replace the battery and allow it to charge for a 24-hour period.

Appendix E contains the power-up and self-test error codes.

2.6 TEST C — DZ — Serial Line Controller

The serial line controller (DZ) controls the four serial lines on the system module. Table 2–2 lists the four serial lines and the port mnemonic for VMS and ULTRIX operating systems.

Run self-test and the system exerciser to troubleshoot the DZ circuits. Enter **TEST C** to run self-test. Then enter **TEST 50** to see the results, or enter **TEST 80000106** and **C** to run the Field Service system exerciser on just the DZ.

A code of 0000.0001 next to the DZ mnemonic indicates no errors detected with the serial line controller circuits. Replace the system module if any other code is listed.

2.6.1 Additional DZ Information

Loopback connectors must be installed in the printer port and communication port to test the DZ in Field Service mode. They are not needed during customer mode testing because the DZ uses internal loopback switches for transmission testing.

During Field Service mode testing, the serial line drivers are fully tested. Characters are sent out to two of the four serial lines (communication and printer ports). They are verified as they are looped back into the port's receiver. If a loopback connector is not installed or the wrong character is received, an error code is listed in the DZ code for that port.

The DZ circuits are on the system module. Therefore, if an error code for the DZ other than 0000.0001 is indicated, replace the system module. While in Field Service mode, check the loopbacks for proper installation before replacing the system module. If the loopback is not installed on the printer port, a hard error (0000.0200) is listed for that port on the DZ circuits. Appendix E contains the power-up and self-test error codes and Appendix F contains the system exerciser error codes.

In the configuration table (TEST 50), the DZ contains six additional status codes as shown in Figure 2–2. The first four codes are for the serial lines, then the keyboard, and last is the mouse or tablet code. Any code other than the codes shown in Figure 2–2 indicates a failure on that line (except the mouse or keyboard may be unplugged, which will indicate 00000000).

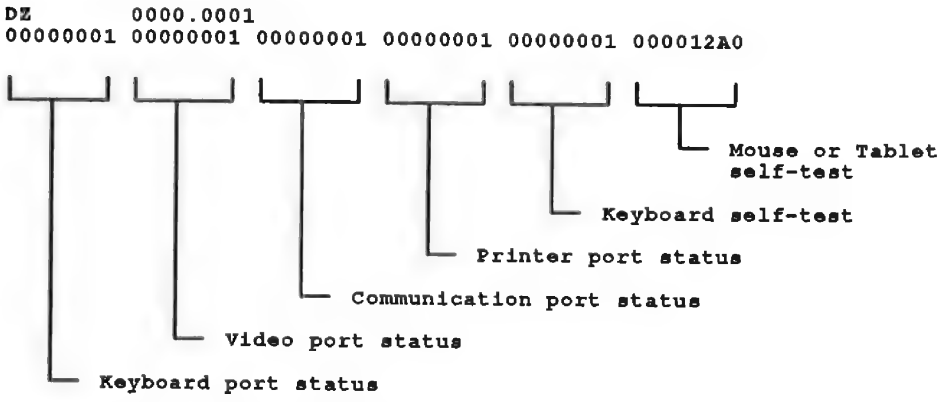


Figure 2–2 DZ Codes in the Configuration Table

Table 2–2 DZ Port Assignments

Port	VMS Mnemonic	ULTRIX Mnemonic
Keyboard	TTA0	
Mouse/tablet	TTA1	
Communication	TTA2	/dev/tty02
Printer	TTA3	/dev/tty03

2.7 TEST B — MEM — Memory

The memory diagnostics test all of the main memory in the system including any memory option modules installed. Therefore, any error for the memory must be deciphered to determine which module contains the error. There may be more than one module containing the error.

Self-test and the system exerciser are used to troubleshoot the memory circuits. Enter **TEST B** to run self-test. Then enter **TEST 50** to see the results or enter **TEST 80000106** and **B** at the prompt to run the Field Service system exerciser on just the memory circuits (loopback required on communication port).

A code of 00XX.0001 (self-test) next to the MEM mnemonic indicates no errors detected with the memory circuits (the XX is the total amount of memory installed in the system (in hexadecimal)). If an error is detected, refer to Section 2.7.1 to determine which module, the system module or one of the memory modules, needs to be replaced.

A code of 0XXX.0001 (system exerciser) next to the MEM mnemonic indicates no errors detected with the memory circuits (the XXX is the number of pages of memory tested during the last pass of the exerciser (1 page = 512 bytes)). Table 2–3 lists the MEM system exerciser error codes and lists which module needs to be replaced when an error is detected.

Table 2–3 MEM System Exerciser Error Codes

Error Codes	Definition
0XXX.0001	Success—No error. XXX = number of pages tested.
0001.000F	Operating system error
0002.000F	Operating system error
0003.000F	Operating system error
0004.000F	Operating system error
0005.000F	Operating system error
0006.000F	Operating system error
0007.000F	Operating system error
0008.000F	Operating system error
0001.001F	Compare error on system module
0002.001F	Compare error on an option module
0001.002F	Parity error on system module
0002.002F	Parity error on an option module

2.7.1 Additional MEM Information

The code for MEM in the configuration table indicates the amount of memory available if no errors are detected. For example, 0010.0001 indicates that 16 Mbytes of memory are available (10 in hexadecimal = 16). The second MEM line in the configuration table contains two 8-digit codes, one of which is not displayed when no errors are detected. The first code repeats the amount of memory in the system and the second code (displayed only if an error is detected) contains the location of the failed memory.

Figure 2–3 shows the second 8-digit number of the MEM display in the configuration table. The 3 in the last digit indicates the error is on the system module. A code other than 0 in the last digit indicates an error on the system module. A code other than 0 in the other seven digits indicates an error on a memory option module.

Each digit contains the status of four banks of memory (1 bank = 1 Mbyte of memory). As shown in Figure 2–3, the last digit contains the status of the four banks of memory on the system module. Table 2–4 lists where each module's banks are in the 8-digit code for all memory option configurations. Refer to Appendix E for additional power-up and self-test error codes and to Appendix F for additional system exerciser error codes.

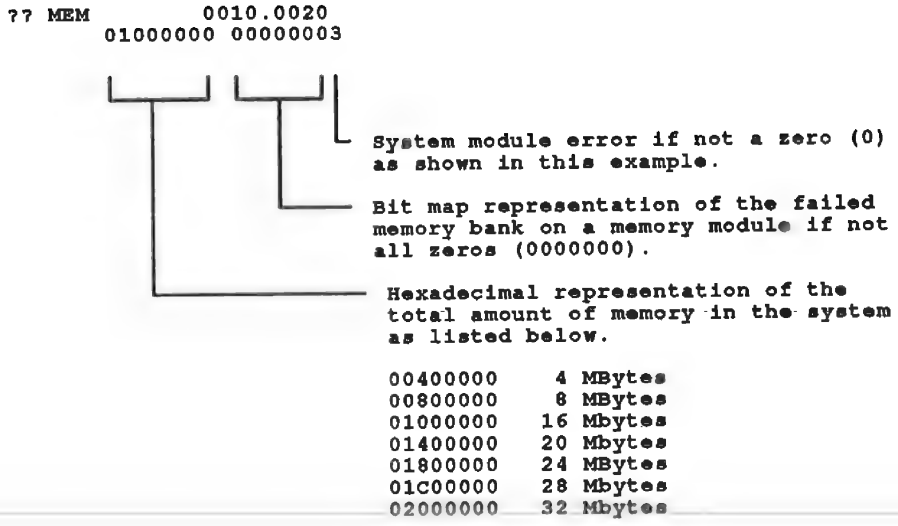


Figure 2–3 MEM Error Display in the Configuration Table

Table 2–4 Locating a Failed Memory Bank

Installed Memory	8-Digit Error Code for MEM							
System Module	0	0	0	0	0	0	0	S
4 Mbyte Module	0	0	0	0	0	0	4	S
12 Mbyte Module	0	0	0	0	12	12	12	S
16 Mbyte Module	0	0	0	16	16	16	16	S
4 and 16 Mbyte Modules	0	0	16	16	16	16	4	S
12 and 16 Mbyte Modules	16	16	16	16	12	12	12	S

2.8 TEST A — MM — Memory Management

The memory management circuits control the allocation of physical and virtual memory.

Self-test is used to troubleshoot the memory management circuits. The system exerciser does not test the MM circuits directly. They are tested when the system exerciser is run on the memory. Enter **TEST A** to run self-test. Enter **TEST 50** to see the results.

A code of 0000.0001 next to the MM mnemonic indicates no errors detected with the memory management circuits. Replace the system module if any other code is listed.

Appendix E contains the power-up and self-test error codes.

2.9 TEST 9 — FP — Floating Point

The floating point (FP) controls the arithmetic operations done for the CPU.

Self-test is used to troubleshoot the floating point circuits. The system exerciser does not test the FP circuits. Enter **TEST 9** to run self-test. Enter **TEST 50** to see the results.

A code of 0000.0001 next to the FP mnemonic indicates no errors detected with the floating point circuits. Replace the system module if any other code is listed.

Appendix E contains the power-up and self-test error codes.

2.10 TEST 8 — IT — Interval Timer

The interval timer (IT) controls key timing operations in the system.

Self-test is used to troubleshoot the interval timer circuits. The system exerciser does not test the IT circuits. Enter **TEST 8** to run self-test. Enter **TEST 50** to see the results.

A code of 0000.0001 next to the IT mnemonic indicates no errors detected with the interval timer circuits. Replace the system module if any other code is listed.

Appendix E contains the power-up and self-test error codes.

2.11 TEST 7 — STRG-1 — RX23 Diskette Drive (Model 30)

The RX23 diskette drive's mnemonic is DUA2 and is located in the system box. STRG-1 is the device name for the RX23 diskette drive on model 30. No other drives in a model 30 system are tested when STRG-1 is tested. Both the self-test and the system exerciser label DUA0, DUA1, and DUA3 off-line. They also label DUA2 as off-line if the test diskette is not properly loaded in the RX23.

Self-test and the system exerciser are used to troubleshoot the STRG-1 controller and the RX23 diskette drive. Enter **TEST 7** to run self-test. Enter **TEST 50** to see the results or enter **TEST 80000106** and **7** at the prompt to run the system exerciser on just the STRG-1 controller and RX23 drive (TEST 80000106 is Field Service mode and the special-keyed test diskette must be installed for a complete read/write test).

A code of 7177.0001 (self-test) next to the STRG-1 mnemonic indicates no errors detected with the STRG-1 circuits and the RX23 is on-line. Refer to Section 2.11.1 if any other code is listed.

A code of X000.0001 (system exerciser) next to the STRG-1 mnemonic indicates no errors detected with the STRG-1 controller (the X is the transfer drive and can be 0 through 3 or F). A code of 2500.0001 under the controller's code indicates no errors detected with the RX23 drive or diskette. Refer to Section 2.11.2 if any other code is listed or if no code is listed when the RX23 is installed in the system.

2.11.1 Additional STRG-1 Self-Test Information

Figure 2–4 shows how the code is broken into five segments: status of DUA3, DUA2, DUA1, DUA0, and the STRG-1 controller.

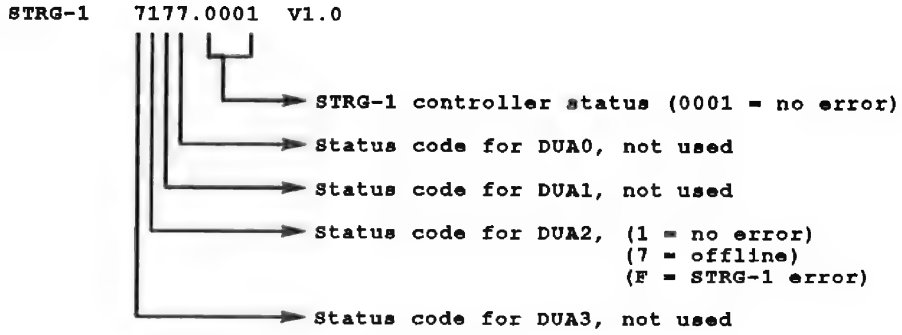


Figure 2–4 RX23 Self-Test Code (STRG-1)

The codes for DUA3, DUA1, and DUA0 should be 7s. The code for the STRG-1 controller should be .0001. The code for DUA2 should be a 1. If any other code (except 7 (off-line) or F (controller failure)) appears for DUA2, check the drive for power, make sure the test diskette is loaded properly, and check the cables for a good connection. If the code is still not a 1, the problem is either in the drive, on the MSC module, in the cables, or on the system module. Refer to Table 2–5 to determine the cause of the problem. A complete listing of the self-test codes are listed in Appendix E.

Table 2–5 Self-Test Codes for the RX23 (0X00.0001)

Error Codes	Description of Error Codes for Each Disk Drive
1	Good — No error for this drive.
2	Drive select error. Disk controller or the drive failed.
3	Read error during read test. The test diskette may not be formatted with the special key. Run the test diskette formatter (TEST 72) on the diskette, then retest the RX23. If this code is listed again, replace the diskette with another formatted test diskette (T 72) and retest the RX23. Replace the drive if this code is listed again.
4	Read after write error. Replace the drive.
6	Drive failed to restore. Replace the drive.
7	Off-line — No drive installed, no diskette loaded in DUA2, or the RX23 is faulty.
8	Drive not done error. Replace the drive.
9	Invalid status from controller. STRG-1 controller failed or the diskette failed. Replace the diskette with another formatted test diskette (T 72) and retest the RX23.
A	Drive select timeout error. Replace the drive.
F	Untested — Drive was not tested because of a hard error found on the STRG-1 controller. For example, FFF8.FFF8 indicates an error on the STRG-1 controller and no drives were tested. Replace the MSC module.

2.11.2 Additional STRG-1 System Exerciser Information

Start the system exerciser for customer mode by entering **TEST 0.** The customer mode exerciser does not perform writes to the RX23 diskette drive.

Start the system exerciser for Field Service mode by installing the loopback connector on the communication port, then by entering **TEST 80000106** and then a **7** at the prompt (on just the RX23). The Field Service mode system exerciser performs a complete read/write test and also performs a data transfer test between the STRG-1 controller and the RX23.

The results of the system exerciser are displayed on the screen after each test pass. Figure 2–5 shows the system exerciser display for the RX23 controller and drive (STRG-1).

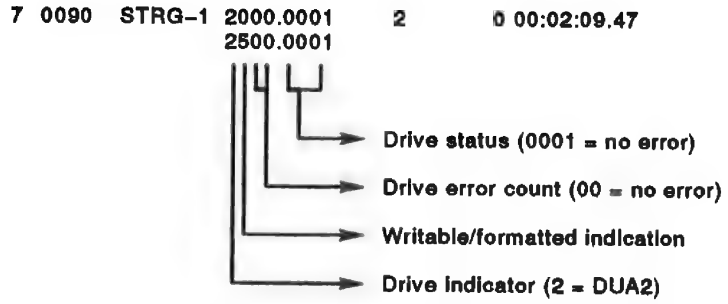


Figure 2–5 Example of System Exerciser Display for the RX23

There is one line for the controller status and one line for the RX23 drive. A drive that is not installed (such as DUA0, DUA1, and DUA3) or is off-line is not listed in the display. For example, no diskette in the RX23 or an unformatted diskette in the RX23 labels DUA2 as off-line and no display for DUA2 is listed. If there are any question marks on the STRG-1 controller's line, replace the MSC module. If there are any question marks on the RX23's line, a hard error in the RX23 is detected or an error in the STRG-1 controller is detected. You must replace one or both to fix the problem. Question marks (? or ??) for the RX23 may indicate bad media on the diskette.

Table 2–6 and Table 2–7 describe the meaning of the codes for the STRG-1s system exerciser. Table 2–6 lists the STRG-1 controller's codes (first line) and Table 2–7 lists the RX23's codes. Appendix F contains a complete listing of the system exerciser error codes.

Table 2–6 STRG-1 Controller System Exerciser Codes

Codes	Explanation of Codes
X000.0001	Indicates the drive used for the data transfer test. 0 = DUA0, 1 = DUA1, 2 = DUA2, 3 =DUA3, and F = no data transfer test.
0X00.0001	Data transfer status (0 = no error).
00XX.0001	Indicates the number of errors detected during the data transfer test (00 = no error).
0000.XXX1	STRG-1 Controller status (000 = no error).

Table 2–7 STRG-1 Disk Drive System Exerciser Error Codes

Code	Explanation of Codes
X000.0001	Indicates the drive. 0 = DUA0, 1 = DUA1, 2 = DUA2, and 3 = DUA3.
0X00.0001	Indicates the drive status as listed below. 5 writable and formatted 4 writable and unformatted 1 nonwritable and formatted 0 nonwritable and unformatted
00XX.0001	Indicates the drive error count (00 = no error)
0000.XXX1	Indicates the drive status (000 = no error)

2.11.3 RX23 Diskette Drive Select Switch Settings

Figure 2–6 shows the only valid switch setting for RX23 diskette drive. It should be set to the zero position which is all the way towards the back.

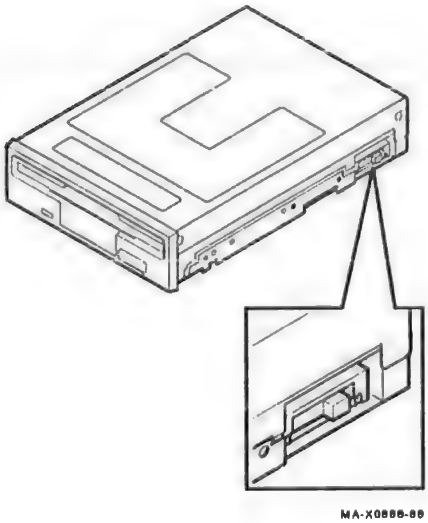


Figure 2–6 RX23 Switch Setting

2.12 TEST 7 — SCSI-A Bus (Models 30 and 40)

The SCSI-A bus on model 30 or model 40 is an internal device bus. It only contains two possible devices: the TZ30 tape drive and the system disk (RZ22 or RZ23). The TZ30 tape drive holds small computer system interface (SCSI) address ID 5 and the system disk holds SCSI address ID 3. Other devices may be connected to this bus but the performance of the operating system will be degraded severely. If there are other devices on the SCSI-A bus, be sure to note their SCSI address ID and type of device since they may be the cause of a problem on the bus.

The procedures for troubleshooting devices on any SCSI bus are similar. You must determine what drives are installed on the SCSI bus you are troubleshooting by physically looking at the drives and their cables and by entering **SHOW DEVICE**. SHOW DEVICE is a command which lists all drives and devices operating in the system and lists which drive is on which SCSI bus. You must also know the different codes for each of these drives so you can identify a faulty drive just by looking at its code in the configuration table and when running the system exerciser. Two items to remember when troubleshooting the SCSI-A bus in either the model 30 or model 40 systems are: TEST 7 starts the diagnostics and the SCSI-A bus is an internal only bus, which means that no external expansion boxes can be connected to this bus (the SCSI-B bus is an internal and external SCSI bus). Refer to Section 2.15 to troubleshoot any SCSI bus (SCSI-A or SCSI-B).

2.13 TEST 6 — SCSI-A and SCSI-B Bus (Model 30)

Two MSC modules are available for the model 30 system. The SCSI/SCSI MSC module contains two SCSI buses (SCSI-A and SCSI-B) and the ST506/SCSI MSC module contains one SCSI bus (SCSI-A) and one bus for the RX23 diskette drive (STRG-1). TEST 6 runs diagnostics on the SCSI-A bus when the ST506/SCSI MSC module is installed and on the SCSI-B bus when the SCSI/SCSI MSC module is installed. The ST506/SCSI MSC module is replaced by the SCSI/SCSI MSC module once an additional adapter module is available for the RX23 diskette drive. This adapter module interfaces the RX23 onto one of the SCSI buses on the SCSI/SCSI MSC module. To determine which MSC module is installed, display the configuration table (T 50) and look for STRG-1, SCSI-A, and SCSI-B. If STRG-1 is listed, the ST506/SCSI MSC module is installed. If SCSI-A and SCSI-B are listed, the SCSI/SCSI MSC module is installed.

The SCSI bus for the TEST 6 diagnostics is an internal and external bus. It can contain three internal devices; the internal TZ30 tape drive, the system disk (RZ22 or RZ23), and a user disk, and up to three external devices; the TK50Z expansion box, the RZ55 disk expansion box, and the RRD40 expansion box. If there are any other devices on the SCSI bus, be sure to note their SCSI

address and type of device since they may be the cause of a problem on the bus. Table 2–8 lists the SCSI address IDs for the devices on the SCSI bus for TEST 6 diagnostics in the model 30 system.

The procedures for troubleshooting devices on any SCSI bus are similar. You must determine what drives are installed on the SCSI bus you are troubleshooting by physically looking at the drives and their cables and by entering **SHOW DEVICE**. SHOW DEVICE is a command which lists all drives and devices operating in the system and lists which drive is on which SCSI bus. You must also know the different codes for each of these drives so you can identify a faulty drive just by looking at its code in the configuration table and when running the system exerciser. Two items to remember when troubleshooting model 30s SCSI bus is that model 30 cannot have an RRD40 drive internally installed and that model 30 only has one SCSI bus when the ST506/SCSI MSC module is installed. Refer to Section 2.15 to troubleshoot any SCSI buses (SCSI-A or SCSI-B for model 30 or model 40).

Table 2–8 Model 30 External SCSI Bus Address ID Assignments

Device	Address ID
RRD40 compact disc drive expansion box (external)	4
RZ23 disk drive (system disk)	3
RZ23 disk drive (user disk)	2
RZ55 disk drive expansion box	1
RZ55 disk drive expansion box (second box)	0
Internal TZ30 tape drive or TK50Z expansion box	5
SCSI bus controller	6
Reserved for expansion	7

2.14 TEST 6 — SCSI-B — SCSI-B Bus (Model 40)

The SCSI-B bus on model 40 is an internal and external device bus. It can contain two internal devices; two user disks (RZ22 or RZ23), and up to four external devices; the TK50Z expansion box, two RZ55 disk expansion box, and the RRD40 expansion box. If there are any other devices on the SCSI-B bus, be sure to note their SCSI address and type of device since they may be the cause of a problem on the bus. Table 2–9 lists the SCSI address IDs for the devices on the SCSI-B bus in the model 40 system.

Table 2–9 Model 40 SCSI Bus Address ID Assignments

Device	Address ID
SCSI-A Bus	
RZ23 disk drive (system disk)	3
Internal TZ30 tape drive	5
Reserved for expansion	7
SCSI-B Bus	
RRD40 compact disc drive (internal or external)	4
RZ23 disk drive	3
RZ23 disk drive (additional drive on SCSI-B bus)	2
RZ55 disk drive expansion box	1
RZ55 disk drive expansion box (second box)	0
SCSI bus controller	6
TK50Z expansion box	5
Reserved for expansion	7

The procedures for troubleshooting devices on any SCSI bus are similar. You must remember what devices are on the bus and know the different codes for these devices so you can identify a faulty device just by looking at its code. Three items to remember when troubleshooting the SCSI-B bus are that the tape device at SCSI address ID 5 is external, the two disks at SCSI address ID 3 and 2 are user disks, and the RRD40 compact disc drive at SCSI address ID 4 can be either internal or external. Refer to Section 2.15 to troubleshoot either the SCSI-A bus or the SCSI-B bus.

2.15 SCSI Bus Troubleshooting (All Models)

To troubleshoot a SCSI bus and its controller (SCSI-A or SCSI-B), run self-test or the system exerciser.

2.15.1 Self-Test

Run self-test to get a quick status of the SCSI buses and the drives on those buses including any devices connected to the SCSI port on the back of the system box. Be sure to plug a SCSI terminator into the SCSI port if no external boxes are connected or into the last daisy-chained box connected to the SCSI port. The TK50Z-FA expansion box does not need termination since it has internal terminators and should always be connected last on the SCSI port daisy chain. However, the TK50Z-GA expansion box (with the SCSI ID switch on the back) does not have the internal resistors installed and it must have the SCSI terminator installed for the SCSI bus to operate properly.

Enter **TEST 6** or **TEST 7** depending on which SCSI bus and which model you are troubleshooting. Enter **TEST 50** to see the results of self-test.

Table 2–10 Self-Test Commands on the SCSI Buses

Model	SCSI Bus	Test Number
30	SCSI-A	6 with ST506/SCSI MSC module installed
30	SCSI-A	7 with SCSI/SCSI MSC module installed
30	SCSI-B	6 with SCSI/SCSI MSC module installed
40	SCSI-A	7
40	SCSI-B	6

2.15.1.1 Self-Test Codes Explained

Figure 2–7 shows an example of SCSI-B codes in the configuration table (SCSI-A codes are similar). There is one line for the status of the SCSI controller and one line that contains the status for all drives on that SCSI bus. The status of the SCSI controller is next to the SCSI-B mnemonic (first line 0000.XXXX) and each drive status is listed by the SCSI address order in the second line.

```
SCSI-B   3B3B.0001
  FFFFFF05 00000001 00000001 00000001 05000001 01000001 FFFFFF03
```

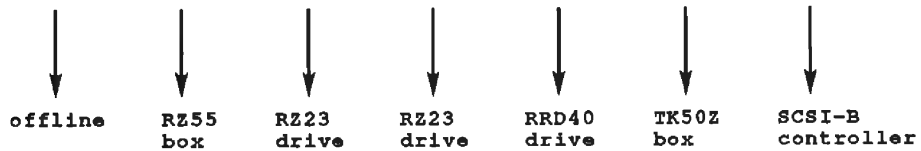


Figure 2–7 Self-Test Example on the SCSI-B Device

An easy way to determine if any errors are detected is by looking for the question marks in the left column. If there are question marks, then one or

more of the drives on the bus are faulty. To determine which device is faulty, examine the status codes of the drives (second line). The address IDs are numbered 0 through 7 from left to right (for example, the RZ55 expansion box is located at SCSI address ID 1 and the RRD40 is located at SCSI address ID 4). Table 2–11 lists the normal status codes for each SCSI device available in the system. Any code other than those previously listed indicates an error in the device at that SCSI address ID.

If a drive is configured for an address ID that indicates FFFFFF05, check the drive's cabling and power and retest. If the code is still FFFFFF05 after retesting, replace the drive. Appendix E contains a complete list of self-test error codes.

Table 2–11 SCSI Devices Self-Test Status Codes

Status Code	SCSI Device
FFFFFF05	Device is off-line or not installed at this address
FFFFFF03	SCSI bus controller
FFFFFFFF	Device not tested - possible SCSI bus controller error
00000001	RZ22, RZ23, or RZ55 disk drive
01000001	TZ30 or TK50 tape drive
05000001	RRD40 compact disc drive

2.15.2 System Exerciser

To start the system exerciser for customer mode, enter **TEST 0**. To start the system exerciser for Field Service mode, enter **TEST 101**, **TEST 102**, or **TEST 80000106**, then **6** or **7** at the prompt. The customer mode system exerciser does not perform reads or writes to the drives. Field Service mode system exerciser performs a complete read/write test on the tape drive and the disk drives (on reserved diagnostics blocks), performs reads on the compact disk drive (if test disk is loaded), and also performs data transfer tests on all drives. For Field Service mode to run properly, you must install the loopback on the communication port, load the special-keyed (T 73) tape cartridge into the tape drive, and load the RRD40 test disc before starting the system exerciser.

The first pass of the system exerciser on a SCSI bus tests the SCSI controller and, if the SCSI controller is operating properly, checks the SCSI bus for the presence of any drives. It does not perform any diagnostics or any data transfer tests on the drives during the first test pass. If the SCSI controller tests bad, an error code is listed in the display and the SCSI bus is not checked for the presence of any drives.

2.15.2.1 System Exerciser Codes Explained

Figure 2–8 shows the system exerciser display for SCSI-B (SCSI-A codes are similar). There is one line for the status of the SCSI controller on the MSC module and one line for each of the drives installed on the SCSI bus. The status of the SCSI controller is next to the SCSI-B mnemonic (first line) and the status of each drive is listed under the controller's code (separate line for each drive).

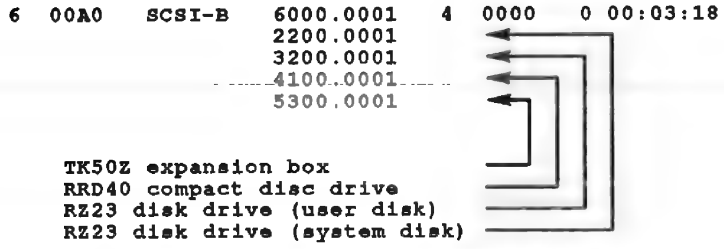


Figure 2–8 System Exerciser Example for SCSI-B Device

An easy way to determine if any errors are detected is by looking for the question marks in the left column. If there are any question marks on the SCSI controller's status line, the SCSI controller is probably faulty and the error code identifies the problem. If there are any question marks on a drive's status line, the problem could be in either the drive, the SCSI bus cabling or terminator, or the SCSI controller. For example, an error that is listed in the drive's code may be a data transfer error and does not isolate the problem to the device itself; it may still be in the SCSI controller. Appendix F contains a complete list of the system exerciser error codes.

2.15.3 Additional SCSI Bus Information

The SCSI bus controller controls up to seven SCSI devices on the SCSI bus. Model 30 has one SCSI controller (SCSI-A) on its ST506/SCSI MSC module and both model 30 and model 40 have two SCSI bus controllers (SCSI-A and SCSI-B) when the SCSI/SCSI MSC module is installed. The SCSI-A bus on the ST506/SCSI MSC module can have internal and external devices connected while the SCSI-A bus on the SCSI/SCSI MSC module can only have internal devices connected. The SCSI-B bus on the SCSI/SCSI MSC module can have internal and external devices connected. The internal devices include the RZ22 or RZ23 disk drive, the RRD40 compact disc drive (model 40 only), the TZ30 tape drive, and the controller itself. The external devices include the TK50Z expansion box, the RZ55 disk expansion box, and the RRD40 compact disc expansion box.

All of the expansion boxes connect to the SCSI port on the back of the system box using a daisy-chain cabling scheme. A SCSI terminator must be installed on the connector of the last expansion box or installed on the SCSI port connector if no expansion boxes are used. The TK50Z-FA expansion box must be installed last on the daisy chain because it contains internal SCSI bus termination resistors and does not need the SCSI terminator connected to it. However, the TK50Z-GA expansion box (with the SCSI ID switch on the back) does not have the internal resistors installed. This expansion box must have the SCSI terminator installed for the SCSI bus to operate properly.

Each device on the SCSI bus, including the SCSI bus controller, has its own address ID location. The SCSI bus controller always holds the address ID of 6 for all buses. The address ID assignments for the devices differ slightly between model 30 and model 40 as shown in Table 2–12 (model 30) and Table 2–13 (model 40). Note that if two RRD40 devices are to be installed (one internal and one external), the internal RRD40 adapter board should be set to address ID 4 and the external expansion box should be set to one of the open address IDs.

Table 2–12 Model 30 SCSI Bus Address ID Assignments

Device	Address ID
SCSI-A Bus (SCSI/SCSI)	
RZ22 or RZ23 disk drive (system disk)	3
TZ30 tape drive	5
SCSI bus controller	6
Reserved for expansion	7
SCSI-A Bus (ST506/SCSI) or SCSI-B (SCSI/SCSI)	
RRD40 compact disc drive expansion box (external)	4
RZ22 or RZ23 disk drive (system disk)	3
RZ22 or RZ23 disk drive (user disk)	2
RZ55 disk drive expansion box	1
RZ55 disk drive expansion box (second box)	0
SCSI bus controller	6
Internal TZ30 tape drive or TK50Z expansion box	5
Reserved for expansion	7

Table 2–13 Model 40 SCSI Bus Address ID Assignments

Device	Address ID
SCSI-A Bus	
RZ23 disk drive (system disk)	3
TZ30 tape drive	5
SCSI bus controller	6
Reserved for expansion	7
SCSI-B Bus	
RRD40 compact disc drive (internal or external)	4
RZ23 disk drive	3
RZ23 disk drive (additional drive on SCSI-B bus)	2
RZ55 disk drive expansion box	1
RZ55 disk drive expansion box (second box)	0
SCSI bus controller	6
TK50Z expansion box	5
Reserved for expansion	7

If you do not know which device is installed at what SCSI address ID or whether the device is on the SCSI-A or SCSI-B bus, enter **SHOW DEVICE** at the console prompt >>>. The SHOW DEVICE command displays all devices connected to the MSC module's bus controllers. This display lists the SCSI address ID of all devices on SCSI buses. Figure 2–9 shows an example of this command.

```
>>> SHOW DEVICE
 ESA0      SE0    08-00-2B-02-CF-A4

 DUA2      RX2                DISK                  RM        RX23

 DKA300    RZ3    A/3/0/00    DISK     104.2 MB     FX        RZ23
 MKA500    TZ5    A/5/0/00    TAPE     ........     RM
 ...HostID....    A/6         INITR

 DKB100    RZ9    B/1/0/00    DISK     430.5 MB     FX        RZ55
 DKB400    RZ12   B/4/0/00    RODISK   xxxxxxxx     RM   WP   RRD40
 ...HostID....    B/6         INITR

>>>
```

Figure 2–9 Example of the SHOW DEVICE Command

In the previous example, ESA0 is the Ethernet device and it displays the Ethernet address of the system. DUA2 is the RX23 diskette drive on the model 30 systems only and it displays that it is a disk (DISK) and it has removable media (RM). The SCSI buses are listed next. Only one SCSI bus (SCSI-A) is listed on the model 30 systems. DKA300 is the RZ23 at address ID 3 on the SCSI-A bus and that contains an ST506/SCSI MSC module. The display shows that it is a fixed disk (FX). MKA500 is the TZ30 at address ID 5 on the SCSI-A bus and displays that it is a tape drive which is removable (RM). HostID is the address ID of the SCSI-A controller (ID 6). DKB400 is the RRD40 at address ID 4 on the SCSI-B bus and displays that it is a read-only disk (RODISK), removable media (RM), and is write-protected (WP). DKB100 is the RZ55 expansion box at address ID 1 on the SCSI-B bus. And the second HostID is the address ID of the SCSI-B controller (ID 6).

If the system does not contain a full configuration of drives internally as previously shown, additional expansion boxes can be connected to the SCSI port using one of the unused SCSI address ID locations. Section 2.15.4 explains how to set the proper SCSI address ID for all devices.

2.15.4 SCSI Bus Address ID Settings

This section shows how each SCSI device's address ID is determined and set.

The jumper and switch settings shown in the following figures are the recommended configurations for the drives. However, the address ID of any drive can be changed to any one of the valid address IDs (0 to 7) as long as there are **not** two devices with the same address ID on the same SCSI bus. Remember that the SCSI/SCSI MSC module has two SCSI buses and each bus operates independently from the other as far as address IDs are concerned.

Figure 2–10 shows the switch settings for the TZ30 tape drive.

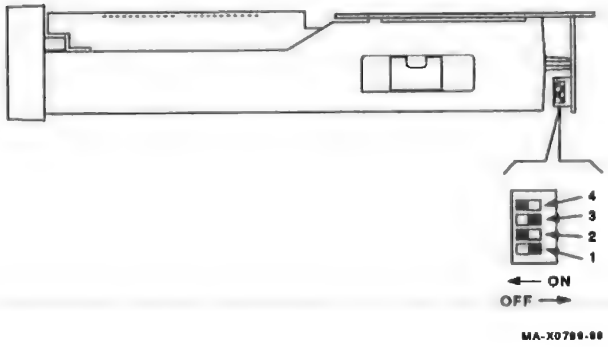


Figure 2–10 TZ30 SCSI Address ID Switch Settings

Address ID on SCSI Bus	TZ30 Tape Drive Switch Settings 4	3	2	1
0	Off	Off	Off	Off
1	On	Off	Off	Off
2	Off	On	Off	Off
3	On	On	Off	Off
4	Off	Off	On	Off
5[2]	On	Off	On	Off
6[1]	Off	On	On	Off
7	On	On	On	Off

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the TZ30 tape drive

Figure 2–11 shows the jumper settings for the RZ22 or RZ23 disk drive.

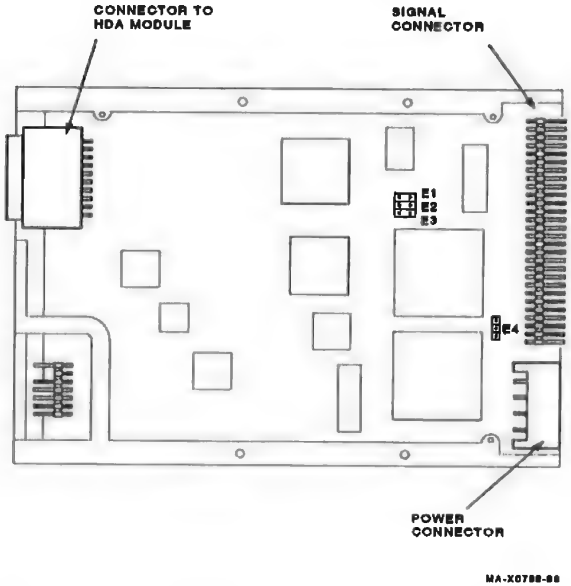


Figure 2–11 RZ22 and RZ23 SCSI Address ID Jumper Settings

Address ID on SCSI Bus	RZ22 and RZ23 Jumper Settings			
	E1	E2	E3	E4
0	Out	Out	Out	Out
1	In	Out	Out	Out
2[2]	Out	In	Out	Out
3[2]	In	In	Out	Out
4	Out	Out	In	Out
5	In	Out	In	Out
6[1]	Out	In	In	Out
7	In	In	In	Out

[1]Reserved address ID for SCSI bus controller
[2]Recommenced address IDs for the RZ22 or RZ23 drives

Figure 2–12 shows the switch settings for the RRD40 compact disc drive and its adapter board when installed in the system box.

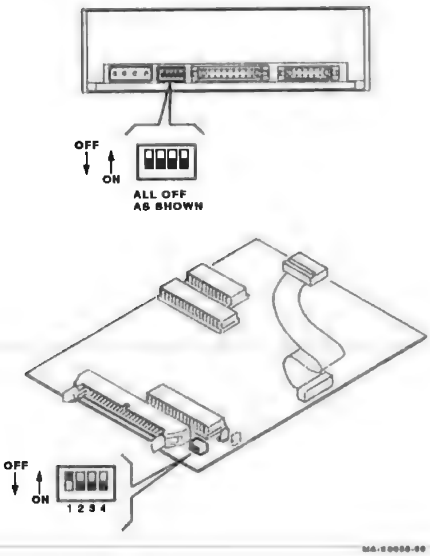


Figure 2–12 RRD40 SCSI Address ID Switch Settings

Address ID on SCSI Bus	RRD40 Adapter Board Switch Settings			
	1	2	3	4
0	Off	Off	Off	Off
1	Off	Off	On	Off
2	Off	On	Off	Off
3	Off	On	On	Off
4[2]	On	Off	Off	Off
5	On	Off	On	Off
6[1]	On	On	Off	Off
7	On	On	On	Off

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the RRD40 compact disc drive

Figure 2–13 shows the switch settings for the RRD40 compact disc drive expansion box.

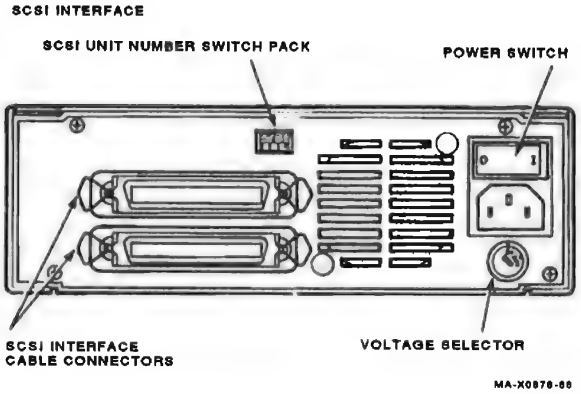


Figure 2–13 RRD40 Expansion Box SCSI Address ID Switch Settings

Address ID on SCSI Bus	RRD40 Expansion Box Switch Settings			
	1	2	3	4
0	Off	Off	Off	Off
1	Off	Off	On	Off
2	Off	On	Off	Off
3	Off	On	On	Off
4[2]	On	Off	Off	Off
5	On	Off	On	Off
6[1]	On	On	Off	Off
7	On	On	On	Off

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the RRD40 compact disc drive

Figure 2–14 shows the switch settings for the TK50Z-GA expansion box. The TK50Z-GA expansion box has the SCSI ID switch on the back of the box.

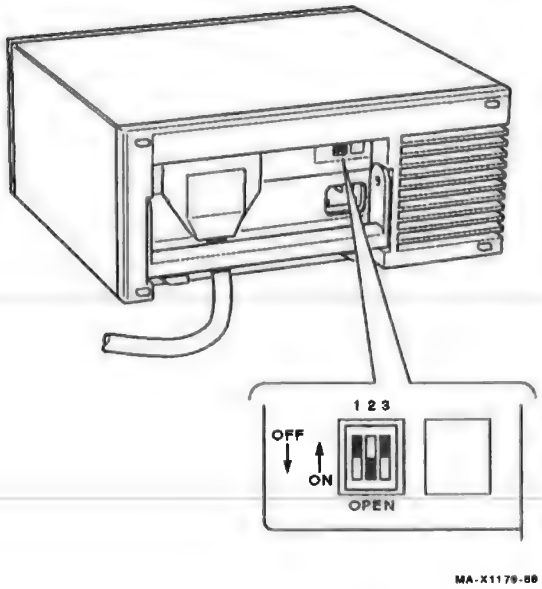


Figure 2–14 TK50Z-GA SCSI Address ID Switch Settings

Address ID on SCSI Bus	TK50Z-GA Expansion Box Switch Settings		
	1	2	3
0	Up	Up	Up
1	Up	Up	Down
2	Up	Down	Up
3	Up	Down	Down
4	Down	Up	Up
5[2]	Down	Up	Down
6[1]	Down	Down	Up
7	Down	Down	Down

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the TK50Z-GA expansion box

Figure 2–15 shows the jumper settings for the TZK50 controller module inside the TK50Z-FA expansion box. The TK50Z-FA expansion box does not have the SCSI ID switch on the back of the box. To change the SCSI address ID of the box, you must remove the cover and set the jumpers on the TZK50 controller board (Figure 2–15).

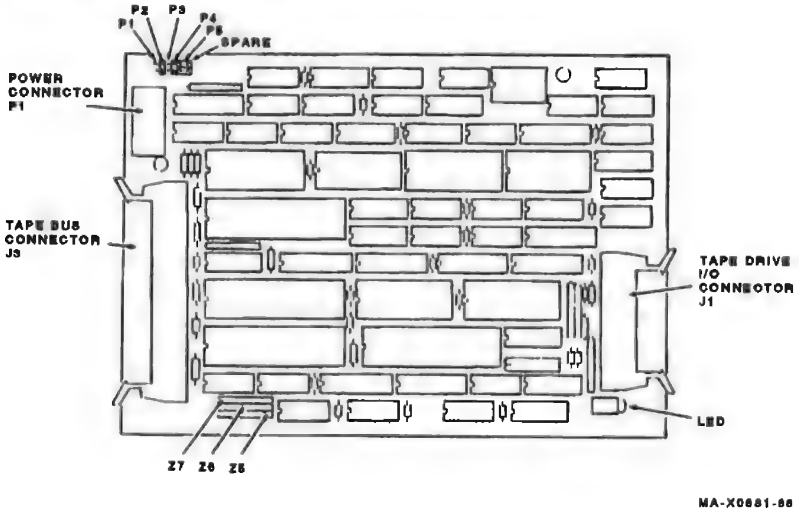


Figure 2–15 TK50Z-FA SCSI Address ID Jumper Settings

Address ID on SCSI Bus	TZK50 Controller Module Switch Settings				
	P1	P2	P3	P4	P5
0	In	In	In	In	Out
1	In	In	Out	In	Out
2	In	Out	In	In	Out
3	In	Out	Out	In	Out
4	Out	In	In	In	Out
5[2]	Out	In	Out	In	Out
6[1]	Out	Out	In	In	Out
7	Out	Out	Out	In	Out

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the TZK50 controller module

Figure 2–16 shows the switch settings for the RZ55 disk drive expansion box.

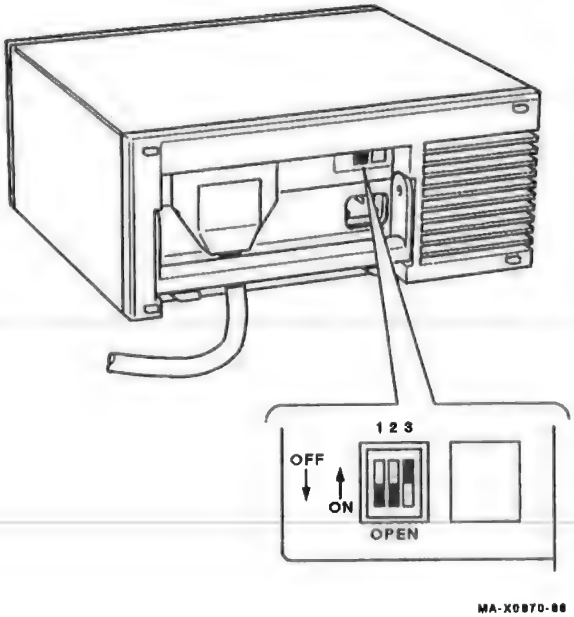


Figure 2–16 RZ55 Expansion Box SCSI Address ID Switch Settings

Address ID on SCSI Bus	RZ55 Expansion Box Switch Settings 1	2	3
0[2]	Down	Down	Down
1[2]	Down	Down	Up
2	Down	Up	Down
3	Down	Up	Up
4	Up	Down	Down
5	Up	Down	Up
6[1]	Up	Up	Down
7	Up	Up	Up

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the RZ55 expansion box

2.16 Troubleshooting a Tape Drive (TEST 6 or 7)

This section describes how to troubleshoot a TZ30 tape drive in the system box or in the TK50Z expansion box. This section assumes you know how to read, decipher, and understand the SCSI bus operation, its codes, and its address ID settings. Refer to Section 2.15 to learn about the SCSI bus operation if you are not familiar with this style of bus. Otherwise, the next two paragraphs explain the self-test and the system exerciser results for the tape drive. Check the SCSI address ID of the tape drive and which bus it is on by using the SHOW DEVICE comand.

Self-test results for the tape device should contain 01000001 in the SCSI address ID 5 location. A code of FFFFFF05 indicates that the device is not installed, not powered up, or faulty. A code of FFFFFFFF indicates that the device was not tested because of a SCSI bus controller error. Any code other than those previously listed indicates an error with the tape device, a cabling problem, or an error with the SCSI controller on the MSC module. Run the internal self-test on the TK50Z expansion box described in Section 6.3.1 if there is a problem with the external tape device. Otherwise, replace the internal TZ30 tape device, retest, then replace the MSC module if replacing the TZ30 tape device did not fix the problem.

When running the system exerciser in Field Service mode with the special keyed tape cartridge installed, the code for the tape device shows that it is not writable (5100.0001) during the first pass. However, the subsequent passes should show that it is removable and writable (5300.0001) as long as the cartridge has a good special key on it and the SCSI controller is operating properly. So you must wait for the system exerciser to complete at least two passes to see if the tape drive (address ID 5 in this case) is operating properly.

2.17 Troubleshooting an RZ22 or RZ23 Disk (TEST 6 or 7)

This section describes how to troubleshoot an RZ22 or RZ23 disk drive. This section assumes you know how to read, decipher, and understand the SCSI bus operation, its codes, and its address ID settings. Refer to Section 2.15 to learn about the SCSI bus operation if you are not familiar with this style of bus. Otherwise, the next two paragraphs explain the self-test and the system exerciser results for the RZ22 or RZ23 disk drive at SCSI address ID 2 and 3. Check the SCSI address ID of the disk drives and which bus they are on by using the SHOW DEVICE comand.

Self-test results for each disk drive should contain 00000001 in the SCSI address ID 2 and/or ID 3 locations depending on how many disk drives are installed. A code of FFFFFF05 indicates that the device is not installed, not powered up, or faulty. A code of FFFFFFFF indicates that the device was not tested because of a SCSI bus controller error. Any code other than those previously listed indicates an error with the disk drive at that address ID location, a cabling problem, or an error with the SCSI controller on the MSC module.

When running the system exerciser in Field Service mode, the code for the disk drive shows that it is writable and that no errors are present (2200.0001 or 3200.0001). Any error code other than those previously listed indicates an error is most likely on the disk, but never rule out the possibility of an error on the SCSI controller itself.

2.18 Troubleshooting an RRD40 Compact Disc Drive (TEST 6)

This section describes how to troubleshoot an RRD40 compact disc drive installed internally or installed in the RRD40 compact disc expansion box. This section assumes you know how to read, decipher, and understand the SCSI bus operation, its codes, and its address ID settings. Refer to Section 2.15 to learn about the SCSI bus operation if you are not familiar with this style of bus. Otherwise, the next two paragraphs explain the self-test results and the system exerciser results for the RRD40 compact disc drive at SCSI address ID 4. Check the SCSI address ID of the RRD40 drive and which bus it is on by using the SHOW DEVICE comand.

Self-test results for the RRD40 drive should contain 05000001 in the SCSI address ID 4 location. A code of FFFFFF05 indicates that the device is not installed or not powered up. A code of FFFFFFFF indicates that the device was not tested because of a SCSI bus controller error. Any code other than those previously listed indicates an error with the compact disc drive, its adapter board, a cabling problem, or an error with the SCSI bus controller on the MSC module. The RRD40 and its adapter board in the system box are one FRU and both must be replaced if an error is detected with the RRD40 drive. The RRD40 expansion box is one FRU (no replaceable FRUs inside) and the whole box must be replaced if an error is detected with the RRD40 expansion box. Be sure that the SCSI bus terminator is connected to the last expansion box on the daisy chain.

When running the system exerciser in Field Service mode with the RRD40 test disc installed, the code for the disc drive shows that it is removable and that no errors are present (4100.0001). The test disc contains known errors imbedded to test the error correction code (ECC) logic. However, any disc can be installed to perform read testing on the RRD40. Any error code other

than those previously listed indicates an error is most likely on the compact disc or its controller module, but never rule out the possibility of an error on the SCSI controller itself.

2.19 TEST 5 — SYS — Interrupt Controller and Ethernet ID ROM

The interrupt controller manages the device interrupts in the system and the Ethernet ID ROM is checked for valid contents. The SYS code shows 0000.0100 if the keyboard is disconnected from the system box.

Self-test is used to troubleshoot the SYS circuits. The system exerciser does not test the SYS circuits. Enter **TEST 5** to run self-test. Enter **TEST 50** to see the results.

A code of 0000.0001 next to the SYS mnemonic indicates no errors detected with the SYS circuits. Replace the system module if any other code is listed (except 0000.0100 as previously described and 0000.0004 as described in the following section).

2.19.1 Additional SYS Information

A code of 0000.0004 next to the SYS mnemonic indicates an error in the Ethernet ID ROM. Since the ROM is not an FRU, you must replace the system module but **do not** swap the Ethernet ID ROM as instructed to when replacing the system module. Leave the ROM on the new system module in this case. Notify the system manager of the new Ethernet ROM since the Ethernet address for the system is now different.

Appendix E contains the power-up and self-test error codes.

2.20 TEST 4 — 8PLN — 8-Plane Graphics Module

The 8-plane graphics module contains the video circuits and memory for color graphics on a color monitor or shades of gray on a monochrome monitor.

Self-test and the system exerciser are used to troubleshoot the graphics module. Enter **TEST 4** to run self-test. Enter **TEST 50** to see the results or enter **TEST 80000106** and **4** at the prompt to run the system exerciser on just the 8-plane graphics module circuits.

A code of 0000.0001 (self-test) next to the 8PLN mnemonic indicates no errors detected with the graphics module. Refer to Section 2.20.1.1 if any other code is listed.

A code of 0000.0001 (system exerciser) next to the 8PLN mnemonic indicates no errors detected with the graphics module. Refer to Section 2.20.1.2 if any other code is listed.

2.20.1 Additional 8PLN Information

If the monitor screen is blank after power-up (no display), check the video cable, check the monitor for power, then check the LEDs on the back of the system box for an error. If the monitor displays any part of a utility pattern (gray scale (T 88) or 8-bar color bars (T 87)), then the problem is probably on the 8-plane graphics module. Replace the 8-plane graphics module. If the monitor is still blank after power-up, replace the system module. Troubleshoot the monitor if the problem still exists. Refer to the monitors service manual for troubleshooting instructions on the monitor.

2.20.1.1 Self-Test

To run self-test in Field Service mode, install the loopback connector on the communication port, and enter **TEST 4**. If using a monochrome monitor, install the two 75-ohm terminators on the video cable's red and blue connectors. Enter TEST 4 at the console prompt >>>. If these 75-ohm terminators are not used, a hard readback error is generated for the 8-plane graphics module (8PLN) in the configuration table.

To run self-test in customer mode, do not install any loopbacks. Enter **TEST 4** at the console prompt >>>. If using a monochrome monitor, install the two 75-ohm terminators on the video cable's red and blue connectors before entering TEST 4. If these 75-ohm terminators are not installed when using a monochrome monitor, a status information readback error is generated for the 8-plane graphics module (8PLN) in the configuration table. After TEST 4 is entered, the screen clears initially and then displays serveral test patterns until the test is done. Display the configuration table (TEST 50) to see the error code (8PLN). Replace the graphics module if any error code is indicated. If the error still exists after replacing the 8-plane graphics coprocessor module, replace the system module.

Appendix E contains a complete listing of the power-up and self-test error codes.

2.20.1.2 System Exerciser

To run the system exerciser in the Field Service mode on the 8-plane graphics coprocessor module, follow these steps.

1. Install the loopback on the communication port.
2. If using a monochrome monitor, attach the two 75-ohm terminators to the video cable's red and blue connectors. If these terminators are not used, the system exerciser returns a hard readback error (XXXX.0020 or XXXX.0021 or XXXX.0022 or XXXX.0023).
3. Enter **TEST 80000106** at the console prompt >>>.
4. Enter **4** at the ?>>> prompt.

To run the system exerciser in customer mode, do not install any loopbacks and enter **T 0** at the console prompt >>>. If using a monochrome monitor, the system exerciser returns a status message (0020.XXXX or 0021.XXXX) for the 8-plane graphics module (8PLN). With no terminators, ignore the XXXX field for status message. Replace the graphics module if any error code is indicated. If the error still exists after replacing the 8-plane graphics coprocessor module, replace the system module.

Appendix F contains a complete listing of the system exerciser error codes.

2.21 TEST 1 — NI — Ethernet Network

The Ethernet network (NI) circuits control the communication protocol over the ThinWire or standard Ethernet cables. The system contains a Thinwire Ethernet port and a standard Ethernet port on the back of the system box. A switch determines which Ethernet port is enabled for transmission of IEEE 803.2 protocol and an LED lights next to the enabled port.

A code of 0000.0001 (self-test) next to the NI mnemonic indicates no errors detected with the Ethernet circuits. If an error code of xxxx.7001 or higher for ThinWire Ethernet or 0011.700E for standard Ethernet is listed, check the termination of the enabled Ethernet port on the back of the system box and retest. These two codes indicate that the external Ethernet network cable is not terminated properly (for instance, no loopback on the enabled port). A code of 0100.0001 is normal with the standard Ethernet port enabled until the external Ethernet network is operational. Be sure to set the Ethernet switch to enable the correct Ethernet port. Replace the system module if any other code is listed.

A code of 0000.0001 (system exerciser) next to the NI mnemonic indicates no errors detected with the Ethernet circuits. Replace the system module if any other code is listed.

2.21.1 Additional NI Information

When running self-test on the NI circuits, the Ethernet connector on the back of the system box must be terminated properly. If an Ethernet cable is connected to the enabled Ethernet port, it must be terminated properly. If no cable is connected to the enabled Ethernet port, put together a loopback connector by assembling the parts listed in Table 2–14 and connecting it to the enabled port before running self-test. If the enabled Ethernet port is not terminated properly, the NI self-test will detect an error of 0000.7001 or higher for the ThinWire port and 0011.700E for the standard Ethernet port. These termination error codes indicate a possible problem with the Ethernet cable and not neccessarily the Ethernet circuits on the system module. If an error still shows up after replacing the system module and verifying the Ethernet cable, replace the power supply since the 9 Vdc supply is only used by the Ethernet circuits and a problem with this supply would not show up on any other devices. Appendix E contains a complete listing of the power-up and self-test error codes and Appendix F contains a complete listing of the system exerciser error codes.

Table 2–14 Ethernet Port Loopback Connectors

Item	Part Number	Number of Parts Needed
Standard Ethernet Loopback		
Connector terminator	12-22196-01	1
ThinWire Ethernet Loopback		
T-connector	12-25869-01	1
50 ohm terminator	12-26318-01	2

If power-up testing detects an error with the Ethernet circuits, the SET MOP, SHOW MOP, SET TRIG, SHOW TRIG, and SET PSWD commands may not be usable. An error message when entering these commands indicates this. To re-enable these commands, you must fix the error on the Ethernet circuits. If the NI error was an unterminated Ethernet port, then you must terminate the port properly and run TEST 1. Assuming the test passed this time, enter UNJAM at the console prompt >>> before the SET and SHOW commands are reenabled for use.

2.22 Power Supply Troubleshooting Procedures

Follow the flowchart in Figure 2–17 if a problem with the power supply exists.

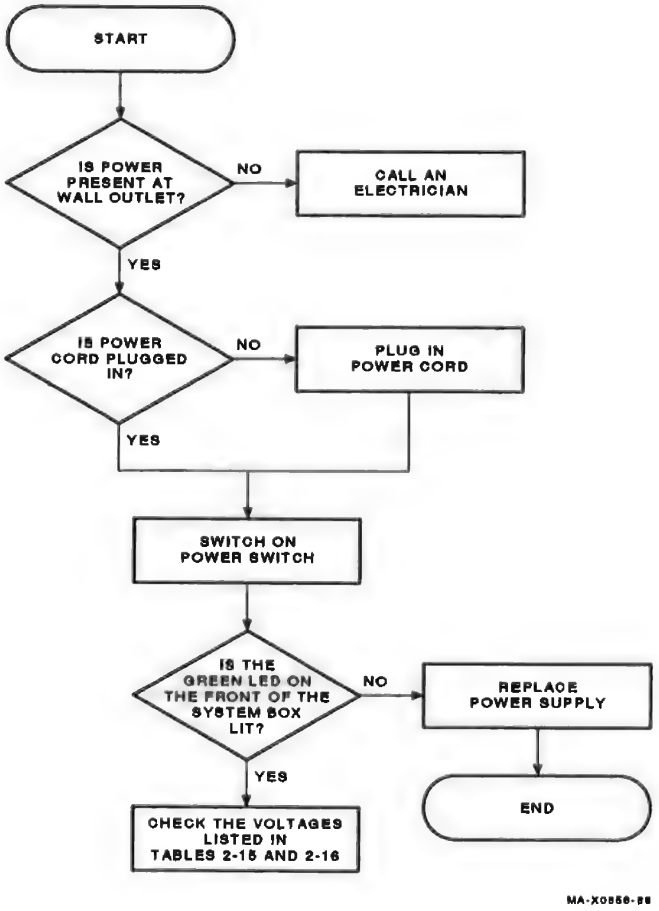


Figure 2–17 Flowchart for Troubleshooting the Power Supply

Figure 2–18 shows the power connector pin voltages on the system module.

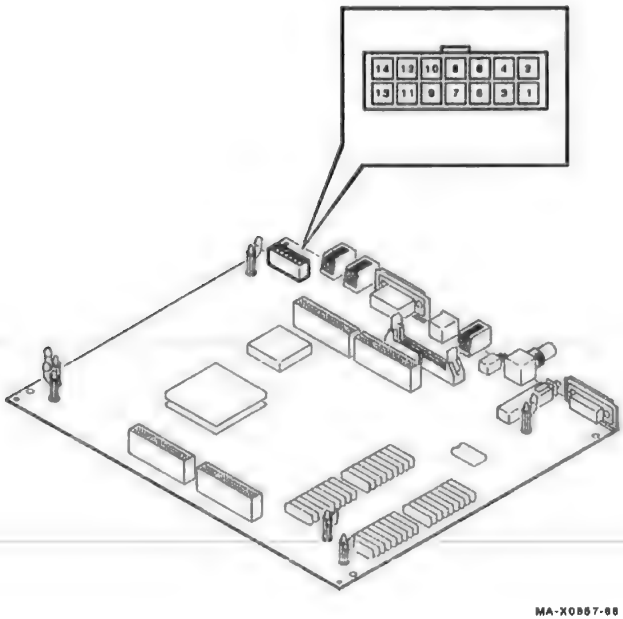


Figure 2–18 Power Connector Pin Voltages on the System Module

Table 2–15 lists the system module power connector voltages.

Table 2–15 System Module Power Connector Voltages

Pin Number	Voltage	Tolerance
1	- 12.1 Vdc	5%
2	Ground	—
3	Ground	—
4	Ground	—
5	+ 5.1 Vdc	5%
6	+ 5.1 Vdc	5%
7	+ 3.5 to + 5.25 Vdc	—
8	+ 5.1 Vdc	5%
9	+ 12.1 Vdc	5%
10	+ 5.1 Vdc	5%
11	Ground	—
12	Ground	—
13	[1]- 9 Vdc	5%
14	[2]- 9 Vdc return	—

[1]Measurement made with negative lead connected to pin 14

[2]Ground for the - 9 Vdc supply (an isolated supply)

Table 2–16 lists the drive power connector voltages.

Table 2–16 Drive Power Connector Voltages

Pin Number	Voltage	Tolerance
1	+ 12.1 Vdc	5%
2	Ground	—
3	Ground	—
4	+ 5.1 Vdc	5%

2.23 Monitor Troubleshooting Procedures

Table 2–17 lists some symptoms of common problems with the monitors. When troubleshooting a monitor, follow the suggested corrective actions in the order listed.

Table 2–17 Monitor Troubleshooting Table

Symptom	Corrective Action
No LED; no raster	Check the power cord connection. Check the 120/240 Vac setting. Check the fuse. Refer to the monitor's pocket service guide.
Compressed raster; no video display	Make sure the monitor cable is connected between the system and the monitor. Make sure the correct cable is used. BC18P or BC23K when a graphics module is not installed. BC19S or BC23J-03 when a graphics module is installed. Adjust the contrast and brightness. Run TEST F on the system if no graphics module is installed. Run TEST 4 if graphics module is installed. If a failure is indicated, replace the graphics module or the system module in the system box before proceeding with troubleshooting the monitor. Refer to the monitor's pocket service guide.
Raster; no video display	Adjust the contrast and brightness. Run TEST F on the system if no graphics module is installed. Run TEST 4 if graphics module is installed. If a failure is indicated, replace the graphics module or the system module in the system box before proceeding with troubleshooting the monitor. Refer to the monitor's pocket service guide.
No LED, but good video display	Refer to the monitor's pocket service guide and replace the LED assembly.

Table 2–17 (Cont.) Monitor Troubleshooting Table

Symptom	Corrective Action
Poor video display	Bring up the appropriate display alignment pattern (TESTS 60, 61, or 62 (without graphics module) or TESTS 80 through 87 (with graphics module)) and perform the appropriate adjustment according to the monitor's pocket service guide.

3
Utilities

The utilities help the user erase a hard disk, set default and restart flags, and display alignment patterns on VS 3100s monitors as well as other functions. Table 3–1 describes and lists the console mode TEST (T) commands that invoke the utilities.

Each utility is available on both model 30 and model 40.

Table 3–1 Utilities

Test Number	Utility Envoked
T 50	Configuration table (also displays the Ethernet hardware address for example, ID 08-00-2B-02-CF-A4)
T 51	Set NVR default boot device
T 52	Set NVR default boot flags
T 53	Set NVR default recovery action flags
T 54	Sets keyboard language
T 55	Shows system exerciser extended summary
T 60[1]	Alignment circle and crosshatch (no graphics module installed)
T 61[1]	Monochrome screen of E's (no graphics module installed)
T 62[1]	Monochrome white screen (no graphics module installed)
T 70	Diskette formatter
T 72	Special key on diskettes for Field Service mode system exerciser
T 73	Special key on tapes for Field Service mode system exerciser
T 75	SCSI disk data eraser
T 80[2]	Circle-crosshatch (color and monochrome monitors)

[1]Will not work with an 8-plane graphics module installed

[2]Will work only with an 8-plane graphics module installed

Table 3–1 (Cont.) Utilities

Test Number	Utility Envoked
T 81[2]	Screen of all E's (color and monochrome monitors)
T 82[2]	White screen (color and monochrome monitors)
T 83[2]	4-bar color bar
T 84[2]	Red screen
T 85[2]	Green screen
T 86[2]	Blue screen
T 87[2]	8-bar color bar
T 88[2]	Gray scale (color and monochrome monitors)

[2]Will work only with an 8-plane graphics module installed

3.1 Configuration Table

The configuration table lists the status/error of each device installed in the system. This configuration table holds the results of the self-test and power-up tests and is updated each time self-test is run. Figure 3–1 shows an example of the configuration table. The codes for each device are listed in Appendix E.

NOTE

Remember that the configuration table contains the results of the self-test and power-up tests and not the results of the system exerciser.

```
>>> TEST 50

KA42-A V1.0
ID 08-00-2B-02-CF-A4

 MONO        0000.0001
 CLK         0000.0001
 NVR         0000.0001
 DZ          0000.0001
    00000001 00000001 00000001 00000001 00000001 000012A0
 MEM         0008.0001
    00800000
 MM          0000.0001
 FP          0000.0001
 IT          0000.0001
 SCSI-A      0808.0001 V1.0
    FFFFFF05 FFFFFF05 FFFFFF05 00000001 FFFFFF05 FFFFFF05 FFFFFF03...
 SCSI-B      C0C0.0001 V1.0
    FFFFFF05 FFFFFF05 FFFFFF05 00000001 FFFFFF05 01000001 FFFFFF03...
 SYS         0000.0001
 8PLN        0000.0001 V1.0
 NI          0000.0001

>>>
```

Figure 3–1 Example of the Configuration Table

NOTE

The 8PLN code will show a soft error (xxxx.0213) when using a monochrome monitor without the 75 ohm terminators installed on the video cable's red and blue cables.

The first line contains the CPU and the ROM version (KA42-A V1.0).

The second line contains the Ethernet hardware address (in this example it is ID 08-00-2B-02-CF-A4). The rest of the display contains the status/error codes for the devices installed on the system. The configuration table is built during power-up testing and the codes are the result of the self-test and power-up tests. This configuration table is the only place the results of self-test are indicated. It is updated every time you run self-test. Additional codes on the DZ, MEM, STRG-1, SCSI-A, and SCSI-B give a more detailed status on these devices as listed in the following section.

3.1.1 DZ Explanation in Configuration Table

The DZ has six 8-digit numbers that contain the status of the four serial lines, the keyboard, and the mouse or tablet. Any 8-digit number other than 00000001 for the four serial lines and the keyboard indicates a failure on that line. A status code of 00000000 for the keyboard indicates that the keyboard is disconnected. The sixth 8-digit number is for the mouse or tablet and any other code than 000012A0 (good status) or 00000000 (nothing connected) indicates a failure in the device connected. Figure 3–2 shows what each 8-digit number represents.

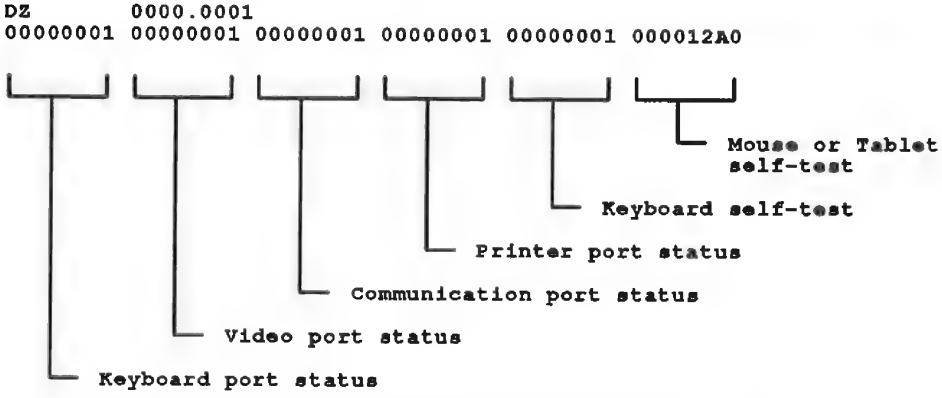


Figure 3–2 Example of the DZ Line in the Configuration Table

3.1.2 MEM Explanation in Configuration Table

The code for MEM in the configuration table indicates the amount of memory available if no errors are detected. For example, 0010.0001 indicates that 16 Mbytes of memory are available (10 in hexadecimal = 16). The second MEM line in the configuration table contains two 8-digit codes, one of which is not displayed when no errors are detected. The first code repeats the amount of memory in the system and the second code (displayed only if an error is detected) contains the location of the failed memory.

Figure 3–3 shows the second 8-digit number of the MEM display in the configuration table. The 3 in the last digit indicates the error is on the system module. A code other than 0 in the last digit indicates an error on the system module. A code other than 0 in the other seven digits indicates an error on a memory option module.

Each digit contains the status of four banks of memory (1 bank = 1 Mbyte of memory). Figure 3–3, shows that the last digit contains the status of the four banks of memory on the system module. Table 3–2 lists where each module's banks are in the 8-digit code for all memory option configurations.

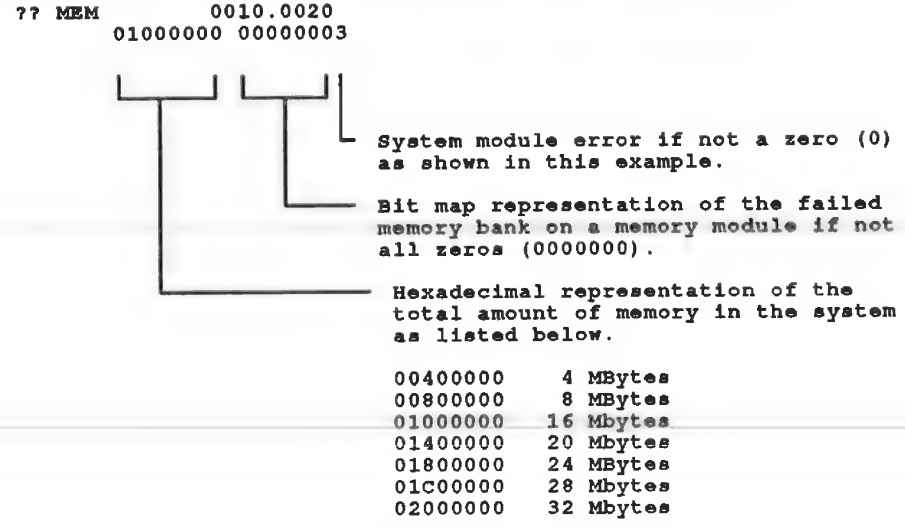


Figure 3–3 MEM Error Display in the Configuration Table

Table 3–2 Locating a Failed Memory Bank

Installed Memory	8-Digit Error Code for MEM							
System module	0	0	0	0	0	0	0	S
4 Mbyte module	0	0	0	0	0	0	4	S
12 Mbyte module	0	0	0	0	12	12	12	S
16 Mbyte module	0	0	0	16	16	16	16	S
4 and 16 Mbyte modules	0	0	16	16	16	16	4	S
12 and 16 Mbyte modules	16	16	16	16	12	12	12	S

3.1.3 STRG-1 (Model 30) Explanation in Configuration Table

The STRG-1 has an additional status line containing four 8-digit numbers that contain the block size of the DUA0, DUA1, DUA2, and DUA3 devices. However, only the DUA2 device is used if the ST506/SCSI MSC module is installed with the RX23 diskette drive. The status codes of the other three

devices should always be 0 as shown. Figure 3–4 shows the status codes that contain the sizes of the drives.

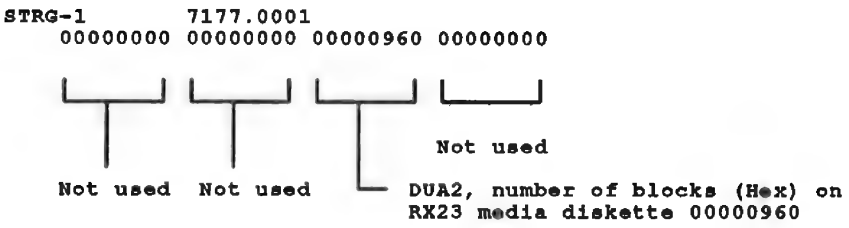


Figure 3–4 STRG-1 Lines in the Configuration Table

3.1.4 SCSI Bus Explanation (SCSI-A and SCSI-B) in Configuration Table

The SCSI bus device displays eight 8-digit numbers as shown in Figure 3–5. Each of the 8-digit numbers contain the status of a device at a particular SCSI address on the SCSI bus. Up to six devices can be connected to each SCSI bus.

Figure 3–5 shows the address ID locations for the six possible drives on a SCSI bus.

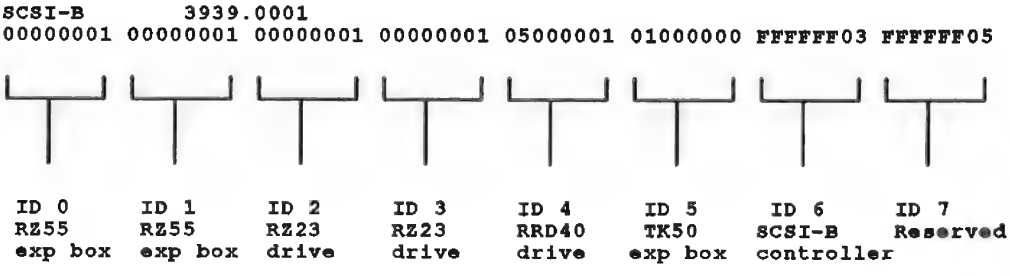


Figure 3–5 SCSI-B Line in the Configuration Table

3.1.4.1 SCSI Address ID Assignments

Each device on the SCSI bus, including the SCSI bus controller, has its own address ID location. The SCSI bus controller always holds the address ID of 6 for all buses. To determine what a drive's code indicates, see the troubleshooting section for that drive.

The address ID assignments for the devices differ slightly between model 30 and model 40 as shown in Table 3–3 (model 30) and Table 3–4 (model 40). Note that if two RRD40 devices are to be installed (one internal and one external), the internal RRD40 controller board should be set to address ID 4 and the external expansion box should be set to one of the open address IDs.

Table 3–3 Model 30 SCSI Bus Address ID Assignments

Device	Address ID
SCSI-A Bus (SCSI/SCSI)	
RZ22 or RZ23 disk drive (system disk)	3
TZ30 tape drive	5
SCSI bus controller	6
Reserved for expansion	7
SCSI-A Bus (ST506/SCSI) or SCSI-B (SCSI/SCSI)	
RRD40 compact disc drive expansion box (external)	4
RZ22 or RZ23 disk drive (system disk)	3
RZ22 or RZ23 disk drive (user disk)	2
RZ55 disk drive expansion box	1
RZ55 disk drive expansion box (second box)	0
SCSI bus controller	6
Internal TZ30 tape drive or TK50Z expansion box	5
Reserved for expansion	7

Table 3–4 Model 40 SCSI Bus Address ID Assignments

Device	Address ID
SCSI-A Bus	
RZ23 disk drive (system disk)	3
TZ30 tape drive	5
SCSI bus controller	6
Reserved for expansion	7
SCSI-B Bus	
RRD40 compact disc drive (internal or external)	4
RZ23 disk drive	3
RZ23 disk drive (additional drive on SCSI-B bus)	2
RZ55 disk drive expansion box	1
RZ55 disk drive expansion box (second box)	0
SCSI bus controller	6
TK50Z expansion box	5
Reserved for expansion	7

3.1.4.2 Determining SCSI Address IDs for Drives in the System

If you do not know which device is installed at what SCSI address ID or whether the device is on the SCSI-A or SCSI-B bus, enter **SHOW DEVICE** at the console prompt >>>. The SHOW DEVICE command displays all devices connected to the MSC module's bus controllers. This display lists the SCSI address ID of all devices on SCSI buses. Figure 3–6 shows an example of this command.

```
>>> SHOW DEVICE
 ESA0      SE0    08-00-2B-02-CF-A4

 DKA300    RZ3    A/3/0/00  DISK     104.6 MB  FX       RZ23
 MKA500    TZ5    A/5/0/00  TAPE     ........  RM
 ...HostID....    A/6       INITR

 DKB100    RZ9    B/1/0/00  DISK     370.7 MB  FX       RZ55
 DKB200    RZ10   B/2/0/00  DISK     102.4 MB  FX       RZ23
 DKB400    RZ12   B/4/0/00  RODISK   xxxxxxxx  RM  WP   RRD40
 ...HostID....    B/6       INITR

>>>
```

Figure 3–6 Example of the SHOW DEVICE Command

In the previous example, ESA0 is the Ethernet device and it displays the Ethernet address of the system. The SCSI buses are listed next. Only one SCSI bus (SCSI-A) is listed on the model 30 systems with the ST506/SCSI MSC module. DKA300 is the RZ23 at address ID 3 on the SCSI-A bus and displays that it is a fixed disk (FX). MKA500 is the TZ30 at address ID 5 on the SCSI-A bus and displays that it is a tape drive which is removable (RM). HostID is the address ID of the SCSI-A controller (ID 6). DKB400 is the RRD40 at address ID 4 on the SCSI-B bus and displays that it is a read-only disk (RODISK), removable media (RM), and is write-protected (WP). DKB100 is the RZ55 expansion box at address ID 1 on the SCSI-B bus. DKB200 is the RZ23 at address ID 2 on the SCSI-B bus. The second HostID is the address ID of the SCSI-B controller (ID 6).

If the system does not contain a full configuration of drives internally, additional expansion boxes can be connected to the SCSI port of one of the unused SCSI address ID locations. Section 2.15.4 explains how to set the proper SCSI address ID for all devices.

3.1.5 Determining the Revision Levels in the System Module's ROM

The ROMs on the system module contain four separate sections of program code. These sections are the self-test code, console code, VMB code, and the ROM code and all have different internal revision levels. Enter **SHOW VER** to see the internal revision levels of the self-test, console, VMB, and ROM code displayed next to the KA42-A. An example of these revision levels is shown in Figure 3–7. The V0.17C is for the self-test revision level, 0BF is the console code revision level, V2.1 is for the VMB revision level, and 239 is the ROM code revision level.

```
>>> SHOW VER

 KA42-A V0.17C-0BF-V2.1-239
        PST: 0BF
        CON: 17C
        VMB: V2.1
        ROM: 239
```

Figure 3–7 Example of the System Module's ROM Code Revision Levels

3.1.6 Determining the Revision Levels of the TK50Z Expansion Box's ROMs

The TK50Z expansion box contains two ROMs. One ROM is on the TZK50 controller board and the other ROM is in the TK50 tape drive. Perform the following steps to determine the revision levels of these two ROMs.

1. Power up the TK50Z expansion box.
2. Unload and remove any tape cartridge from the TK50 tape drive.
3. Enter **Test 73**.
4. Enter **5** when the system prompts with VStmk_QUE_id (1,2,3,4,5,6,7) ?.
5. Enter **60000001** when the system prompts with VStmk_QUE_RUsure (1/0) ?.
6. The screen will scroll fast. Stop the screen from scrolling as soon as you see the information shown in Figure 3–8.

   NOTE

   To stop scrolling, press Ctrl S, to start scrolling, press Ctrl Q.

```
          .
          .
          .
receive_diagnostic
  command:  1C 00 00 00 50 00
  data_in:  05 1E 00 0A 0D 00
  status :  00
  msg_in :  00
          .
          .
          .
```

Figure 3–8 Example of SCSI Port Bus Information

7. Determine the revision level of the ROMs by examining the data_in: line (Figure 3–9). These revision level codes are in hexadecimal.

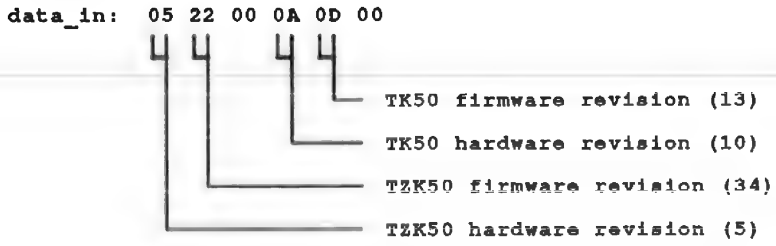


Figure 3–9 Example of the TZK50 and TK50 ROM Revision Levels

3.2 Setting NVR Default Boot Device (T 51)

Use the TEST 51 utility or use the SET BOOT command to set the boot device. Both methods set the default boot device in the NVR. There are several boot device names to choose from. Table 3–5 lists the boot device names and which device they indicate. Figure 3–10 shows an example of changing the default boot device from four periods (....), no default device listed which indicates that ESA0 would be the boot device, to DKA200 (RZ23 in the system box).

Table 3–5 Boot Device Names

Boot Device	Device Type	Explanation
DKAx00	Hard disk	RZ22, RZ23, or RZ55 on SCSI-A bus at address ID x.
DKBx00	Hard disk	RZ22, RZ23, or RZ55 on SCSI-B bus at address ID x.
MKAx00	Tape drive	TZ30 or TK50 on SCSI-A bus at address ID x.
MKBx00	Tape drive	TZ30 or TK50 on SCSI-B bus at address ID x.
DUA2	Diskette drive	RX23 on model 30 system
ESA0	Ethernet network	System boots off another node.

```
>>> TEST 51
    .... ? >>> DKA200
>>>
OR
>>> SET BOOT DKA200
>>>
```

Figure 3–10 Example of Changing the Default Boot Device

Press Return to exit TEST 51 without changing the default boot device. Enter a period (.) to clear the default boot device from NVR. Enter the device, such as **DKA200**, to set the default boot device to that device.

3.3 Setting NVR Default Boot Flags (T 52)

Use the TEST 52 utility or use the SET BFLG command to set the boot flags. Both methods set the default boot flags in the NVR. Table 3–6 lists the boot flags that the ULTRIX operating system uses and Table 3–7 lists the boot flags that the VMS operating system uses. Figure 3–11 shows an example of changing the default boot flag from 00000000 to 00000010 (diagnostic boot). Press Return to exit TEST 52 without changing the default boot flag.

```
>>> TEST 52
    00000000 ? >>> 00000010

>>>

OR

>>> SET BFLG 00000010
>>>
```

Figure 3–11 Example of Changing the Default Boot Flag

You can specify one or any combination of boot flags in the NVR. To specify more than one flag, enter the sum value (in hexadecimal) of the flags that you want loaded into the NVR. For example, if you want to specify the RPB$V_DIAG flag, RPB$V_HALT flag, and the RPB$V_MPM flag, add all three flags as shown in Figure 3–12 and enter the sum into NVR.

```
RPB$V_DIAG   ---   00000010
RPB$V_HALT   ---   00000200
RPB$V_MPM    ---   00000800
                   --------
Enter this code    00000A10
```

Figure 3–12 Determining the NVR Code for Three Boot Flags

Table 3–6 Boot Flags Used by ULTRIX

Flag	Definition
00000001	RPB$V_CONV — Conversational boot. This will force ULTRIXBOOT to prompt the user for an image name which would presumably be different from the default 'vmunix'. If the DIAG is also on, then the user is prompted for the diagnostic supervisor image name.
00000002	RPB$V_DEBUG — If this flag is set, the ULTRIX kernal image is booted to single-user mode.
00000004	RPB$V_INIBPT — Initial breakpoint. If RPB$V_DEBUG is set, VMS executes a BPT instruction immediately after enabling mapping.
00000008	RPB$V_BBLOCK — Seondary boot from boot block. Secondary bootstrap is a single 512 byte block, whose LBN is specified in R4. R4 must be 0 for ULTRIX.

Table 3–6 (Cont.) Boot Flags Used by ULTRIX

Flag	Definition
00000010	RPB$V_DIAG — Diagnostic boot. This causes ULTRIXBOOT to load the appropriate diagnostic supervisor by CPU type. The default path is /field/e?saa.exe, where the partition is specified in bits 31:28 of this register.
00000020	RPB$V_BOOBPT — Bootstrap breakpoint. Stops the primary and secondary bootstraps with a breakpoint instruction before testing memory.
00000040	RPB$V_HEADER — Image header. Takes the transfer address of the secondary bootstrap image from that file's image header. If RPB$V_HEADER is not set, transfers control to the first byte of the secondary boot file.
00000080	RPB$V_NOTEST — Memory test inhibit. Sets a bit in the PFN bit map for each page of memory present. Does not test the memory.
00000100	RPB$V_SOLICT — File name. Prompt for the name of a secondary bootstrap file.
00000200	RPB$V_HALT — Halt before transfer. Executes a halt instruction before transferring control to the secondary bootstrap.
00000400	RPB$V_NOPFND — No PFN deletion (not implemented; intended to tell VMB not to read a file from the boot device that identifies bad or reserved memory pages, so that VMB does not mark these pages as valid in the PFN bitmap).
00000800	RPB$V_MPM — Specifies that multiport memory is to be used for the total exec memory requirement. No local memory is to be used. This is for tightly-coupled multiprocessing.
00001000	RPB$V_USEMPM — Specifies that multiport memory should be used in addition to local memory, as though both were one single pool of pages.
00002000	RPB$V_MEMTEST — Specifies that a more extensive algorithm be used when testing main memory for hardware uncorrectable (RDS) errors.
00004000	RPB$V_FINDMEM — Requests use of MA780 memory if MS780 is insufficient for booting. Used for 11/782 installations.
00008000	RPB$V_AUTOTEST — Used by diagnostic supervisor.
00010000	RPB$V_CRDTEST — Request pages with CRD errors are not to be removed from bitmap.

Table 3–6 (Cont.) Boot Flags Used by ULTRIX

Flag	Definition
X0000000	RPB$V_TOPSYS — Redefines the default load file system partition. This field is used primarily with DIAG. The following corresponding partition numbers and letters are: 0 = a 1 = b 2 = c 3 = d 4 = e 5 = f 6 = g 7 = h

Table 3–7 Boot Flags Used by VMS

Flag	Definition
00000001	RPB$V_CONV — Conversational boot. At various points in the system boot procedure, the bootstrap code solicits parameters and other input from the console terminal. If the DIAG is also on, the diagnostic supervisor then enters MENU mode and prompts the user for devices to test.
00000002	RPB$V_DEBUG — Debug. If this flag is set, VMS maps the code for the XDELTA debugger into the system page tables of the running system.
00000004	RPB$V_INIBPT — Initial breakpoint. If RPB$V_DEBUG is set, VMS executes a BPT instruction immediately after enabling mapping.
00000008	RPB$V_BBLOCK — This skips the files-11 boot and performs only the boot block type boot.
00000010	RPB$V_DIAG — Diagnostic boot. Secondary bootstrap is image called [SYSMAINT]DIAGBOOT.EXE.
00000020	RPB$V_BOOBPT — Bootstrap breakpoint. Stops the primary and secondary bootstraps with a breakpoint instruction before testing memory.
00000040	RPB$V_HEADER — Image header. Takes the transfer address of the secondary bootstrap image from that file's image header. If RPB$V_HEADER is not set, transfers control to the first byte of the secondary boot file.

Table 3–7 (Cont.) Boot Flags Used by VMS

Flag	Definition
00000080	RPB$V_NOTEST — Memory test inhibit. Sets a bit in the PFN bit map for each page of memory present. Does not test the memory.
00000100	RPB$V_SOLICT — File name. Prompt for the name of a secondary bootstrap file.
00000200	RPB$V_HALT — Halt before transfer. Executes a halt instruction before transferring control to the secondary bootstrap.
00000400	RPB$V_NOPFND — No PFN deletion (not implemented; intended to tell VMB not to read a file from the boot device that identifies bad or reserved memory pages, so that VMB does not mark these pages as valid in the PFN bitmap).
00000800	RPB$V_MPM — Specifies that multiport memory is to be used for the total exec memory requirement. No local memory is to be used. This is for tightly-coupled multiprocessing. If the DIAG is also on, then the diagnostic supervisor enters AUTOTEST mode.
00001000	RPB$V_PFILE — (overlays RPB$V_USEMPM) File name. Prompt for the name of the parameters file on a network bootstrap operation.
00002000	RPB$V_MEMTEST — Specifies that a more extensive algorithm be used when testing main memory for hardware uncorrectable (RDS) errors.
00004000	RPB$V_FINDMEM — Requests use of MA780 memory if MS780 is insufficient for booting. Used for 11/782 installations.
00008000	RPB$V_AUTOTEST — Used by diagnostic supervisor.
00010000	RPB$V_CRDTEST — Request pages with CRD errors to be removed from bitmap.
X0000000	RPB$V_TOPSYS — The X position specifies the top level directory number for system disks with multiple systems.

3.4 Setting the NVR Default Recovery Action Flags (T 53)

Use the TEST 53 utility or by use the SET HALT command set the recovery action flag. Both methods set the default recovery action in the NVR. The default recovery action flag is used by the system during power up and also if the system detects a severe error of its operating environment. There are three flags to choose from: restart, boot, or halt. Restart searches for the restart

parameter block (RPB) in memory (the RPB contains addresses of certain registers that hold restart information). Boot starts booting the operating system software. Halt automatically halts the system and enters console mode. Table 3–8 lists the recovery flags available.

Table 3–8 Default Recovery Flags

Number	Recovery Action Flag
1	Restart
2	Boot
3	Halt

Figure 3–13 shows an example of changing the flag from 2 (boot) to 3 (halt). Press Return to exit TEST 53 without changing the flag.

```
>>> TEST 53
    2 ? >>> 3

>>>

OR

>>> SET HALT 3
>>>
```

Figure 3–13 Example of Changing the NVR Recovery Action Flags

3.5 Setting the Keyboard Language (T 54)

Use the TEST 54 utility or use the SET KBD command to set the keyboard language. Both methods set the default keyboard language in the NVR.

The T 54 utility displays the language inquiry menu on the console device. To choose another language for the keyboard, enter TEST 54 and select the proper language or enter the language selection using the SET KBD command. Press RETURN on T 54 to obtain the console prompt without changing the language.

3.6 Extended Summaries for the System Exerciser (T 55)

Extended summaries are available only when running the system exerciser in Field Service mode. When running TEST 101, extended summaries are available when the testing automatically stops after the second pass. When running TEST 102, extended summaries are available when you halt the tests by pressing Ctrl C after the second pass of the test is complete. When running TEST 80000106, extended summaries are not available. To display the results of the tests once again press the halt button after the second pass of the test is complete and enter SHOW ESTAT at the console prompt >>>. Extended summaries contain additional error information on some of the devices run by the exerciser. Press Return to display the first extended summary. Continue pressing a Return to display all of the extended summaries until you return to the exerciser display. Press a second Ctrl C to halt the extended summaries and return to the console prompt >>>. Press a Return to stop the extended summary for the SHOW ESTAT command. The halt message is displayed when the exerciser is stopped and control is returned to the console.

Figure 3–14 shows an example of the extended summary on the SCSI-B device. The ADR is the SCSI address ID of the a drive, RDS is the number of reads performed on that drive, WTS is the number of writes performed on that drive, XFS is the number of data transfers performed on that drive, and XFERR is the number of transfer errors on that drive.

To display the extended summaries once again after exiting the system exerciser, enter SHOW ESTAT or enter T 55. SHOW ESTAT brings up extended summary information from the last time the Field Service system exerciser ran. T 55 does the same as SHOW ESTAT, but T 55 destroys the data once it is displayed on the screen.

```
KA42-A   V1.0              01            FS
******** SCSI-B                 STM_SUMM              0 00:05:57 ******

1 70 00 02 00 00 00 00 0A 00 00 00 00 04 00 00 00 00 00

      ADR          RDS         WTS         XFS         XFERR         SDE
      ---          -------     -------     -------     -------       ---

      003          008         000         157         000           1
      004          008         000         073         000           1
      005          008         004         023         000           1

********* STM_TYPE_ANYTHING
```

Figure 3–14 Extended Summary Report Example

3.7 Circle-Crosshatch Alignment Pattern

This utility sends the circle-crosshatch alignment pattern to the monitor connected to the video port. Enter **T 60** to display the circle-crosshatch alignment pattern when an 8-plane graphics module is not installed. Enter **T 80** when an 8-plane graphics module is installed. A loopback must be attached to the communication port to run this utility. Press Return to stop the display.

NOTE

Video cable BC19S must be used any time an 8-plane graphics module is installed regardless of the type of monitor used.

3.8 Screen of E's Pattern

This utility sends a full screen of E's to the monitor connected to the video port. Enter **T 61** to display the screen of E's pattern when an 8-plane graphics module is not installed. Enter **T 81** to display the screen of E's pattern when an 8-plane graphics module is installed. Press Return to stop the display.

3.9 White Screen

This utility sends a full white screen to the monitor connected to the video port. Enter **T 62** to display the white screen when an 8-plane graphics module is not installed. Enter **T 82** to display the white screen when an 8-plane graphics module is installed. Press Return to stop the display.

3.10 4-Color Bars Screen

This utility is only available when an 8-plane graphics module is installed. This utility sends 4-color bars to the screen on the monitor connected to the video port. Enter **T 83** to display the 4-color bars on the screen. A loopback connector must be attached to the communication port to run this utility.

3.11 Red Screen

This utility is only available when an 8-plane graphics module is installed. This utility sends a full red screen to the monitor connected to the video port. Enter **T 84** to display the red screen. A loopback connector must be attached to the communication port to run this utility.

3.12 Green Screen

This utility is only available when an 8-plane graphics module is installed. This utility sends a full green screen to the monitor connected to the video port. Enter **T 85** to display the green screen. A loopback connector must be attached to the communication port to run this utility.

3.13 Blue Screen

This utility is only available when an 8-plane graphics module is installed. This utility sends a full blue screen to the monitor connected to the video port. Enter **T 86** to display the blue screen. A loopback connector must be attached to the communication port to run this utility.

3.14 8-Color Bars Screen

This utility is only available when an 8-plane graphics module is installed. This utility sends 8-color bars to the screen on the monitor connected to the video port. Enter **T 87** to display the 8-color bars on the screen.

3.15 8-Gray Scale Bars Screen

This utility is only available when an 8-plane graphics module is installed. This utility sends 8-gray scale bars to the screen on the monitor connected to the video port. Enter **T 88** to display the 8-gray scale bars on the screen.

3.16 Mass Storage Diskette Formatter

This utility formats RX23 diskettes. The command to start the formatter is TEST 70. Figure 3–15 shows an example of running the formatter on DUA2 (RX23).

CAUTION
Formatting destroys all user data on the diskette.

```
>>> TEST 70

                        KA42-A  RDRXfmt

VSfmt_QUE_unitno (0-2) ?  2          <--- Enter drive number.

VSfmt_QUE_RXmedtyp
( 1=RX23 ) ? 1                       <--- Enter a 1 for RX23
                                          diskette media.
VSfmt_QUE_RUsure (DUA2 1/0) ? 1      <--- Enter a 1 for yes,
                                          0 for no.
VSfmt_STS_FMTing .....OK             <--- Diskette formatted OK.

VSfmt_STS_CkRXfmt ..... OK           <--- RX23 format checked OK.

VSfmt_RES_Succ                       <--- Diskette is formatted
                                          successfully.

>>>
```

Figure 3–15 Example of Formatting an RX23 Diskette

3.16.1 Diskette Formatter Messages

All messages for the formatter start with VSfmt_. The second segment of the message indicates the type of message; QUE_ for a question that waits for a response, STS_ for a status message, and RES_ for an indication of a resultant message. Table 3–9 lists all the formatter messages and gives an explanation for each.

Table 3–9 Diskette Formatter Messages

Fomatter Message	Explanation
VSfmt_STS_ChkPss	A check pass is being done on the diskette.
VSfmt_STS_CkRXfmt	The RX23 diskette format is being checked.
VSfmt_STS_RXfmt	The RX23 diskette is being formatted.
VSfmt_QUE_RUsure (DUA# 1/0) ?	The formatter uses this question as a safety check. If you want to format the diskette that is indicated by the #, enter 1 for yes. Otherwise, enter any character other than 1 to abort the formatter.
VSfmt_QUE_unitno (0-2) ?	Enter the drive that needs formatting. Enter 2 for DUA2 (a 0 is for DUA0, 1 is for DUA1, and 3 is for DUA3). Any other character aborts the formatter.
VSfmt_RES_Succ	The diskette has been successfully formatted.
VSfmt_RES_Abtd	The RX23 formatter has been aborted.
VSfmt_RES_ERR #	The formatter has been stopped because of the error code indicated by the #. Table 3–10 lists the error codes.

Table 3–10 T 70 Error Codes for the Diskette Formatter

Code	Description
1	Illegal unit number entered.
3	Error occurred during formatting.
5	Error occurred during the diskette check pass.
6	No diskette loaded in the diskette drive or the diskette is not an RX23 media.

3.17 Special Diagnostic Key for Field Service System Exerciser

The removable media (tape cartridge and diskette) in the maintenance kit must have a special diagnostic code written on it that allows the system exerciser to write on this media when running in Field Service mode. Without this special key, such as on normal customer media, the system exerciser does not

do write testing on the removable media devices. This safety feature prevents accidentally destroying the customers programed diskettes or tapes.

There are two utilities that create these special keys. TEST 72 creates a special key on the diskette and TEST 73 creates a special key on the tape. The diskette and tape in the maintenance kit must be initialized with these special diagnostic keys before they can be used. The tape must be initialized every time you use it with the Field Service mode system exerciser, because the special diagnostic key on the tape is destroyed once the exerciser recognizes the key. The special diagnostic key on the diskette is not destroyed when it is used.

Figure 3–16 shows a successful example of creating a special-key diskette.

```
>>> TEST 72

                    KA42-A RXmker

 VSfmk_QUE_MEDtyp (1=RX23) ? 1  <--- Enter media type.
 VSfmk_QUE_RUsure (DUA2 1/0) ? 1          <--- Enter 1 for yes,
                                               0 for no.
 VSfmk_RES_SUCC                           <--- Keyed successfully.

>>>
```

Figure 3–16 Example of Creating the Special Key on a Diskette

Figure 3–17 shows a successful example of creating a special-key tape cartridge. If any errors occur while running TEST 72 or TEST 73, make sure the drive is on-line and operating properly and run the special-key command again. Also, make sure the tape is not write-protected.

```
>>> TEST 73

                        KA42-A TPmker
 VStmk_QUE_id (0,1,2,3,4,5,6,7) ? 5    <--- Enter ID address of drive.
 VStmk_QUE_RUsure (1/0) ? 1            <--- Enter 1 for yes, 0 for no.
 VStmk ..... OK                        <--- Keyed successfully.
>>>
```

Figure 3–17 Example of Creating the Special Key on a Tape Cartridge

3.18 SCSI Mass Storage Disk Data Eraser (T 75)

This utility erases the data on a drive on one of the SCSI buses. The command to start the data eraser is TEST 75. Figure 3–18 shows an example of running the data eraser on the drive located at SCSI address ID 1 on the SCSI-B bus.

CAUTION

This utility destroys all user data on the drive.

```
>>> TEST 75

 PV_SCS_FMT_CHN (A=1,B=0)?  0
 PV_SCS_FMT_ID (0,1,2,3,4,5,6,7)?  1
 PV_SCS_FMT_RUsure (1/0)?  1

 PV_SCS_FMTing.....................................

 PV_SCS_FMT_SUCC

>>>
```

Figure 3–18 Example of Erasing data on an RZ55

Figure 3–19 shows an example of an error while running the data eraser on the drive located at SCSI address 3 on the SCSI-A bus.

```
>>> T 75

 PV_SCS_FMT_CHN (A=1,B=0)?  1
 PV_SCS_FMT_ID (0,1,2,3,4,5,6,7)?  3
 PV_SCS_FMT_RUsure (1/0)?  1

 PV_SCS_FMTing.....................?

 PV_SCS_FMT_ERR#3

>>>
```

Figure 3–19 Example of an Error while Erasing an RZ55

3.18.1 SCSI Disk Eraser Messages

All messages for the data eraser start with PV_SCS_FMT. The second segment of the message indicates what type of information the utility is looking for; _CHN for which SCSI bus the drive is on, _ID (0,1,2,3,4,5,6,7)? for the SCSI address ID of the drive, and _RUsure (1/0)? for one last verification that you do want to erase this drive. Table 3–11 lists all the data erasure messages and gives an explanation for each.

Table 3–11 SCSI Data Eraser Messages

Fomatter Message	Explanation
PV_SCS_FMT_CHN (A=1, B=0)?	Asking which SCSI bus the drive is located on.
PV_SCS_FMT_ID (0,1,2,3,4,5,6,7)?	Asking the SCSI address ID of the drive.
PV_SCS_FMT_RUsure (1/0)?	The data eraser uses this question as a safety check. If you want to erase the drive, enter 1 for yes. Otherwise, enter any character other than 1 to abort the data eraser.
PV_SCS_FMTing	The drive is being erased.
PV_SCS_FMT_ERR#	The eraser has been stopped because of the error code indicated by the #. Table 3–12 lists the error codes.

Table 3–12 T 75 Error Codes for the SCSI Data Eraser

Code	Description
1	Illegal unit number entered.
2	Error occurred during a SCSI bus command.
3	Reassign blocks failed (no more replacement blocks available).
4	Unit not ready.
5	Illegal device type for operation

4

VS 3100 (Model 30) System

4.1 Enclosure Description

The VS 3100 model 30 (VS42A-xx) consists of the system box, monitor, mouse or tablet, and keyboard. The label on the back of the system box indicates which model you are working on. The VS42A-xx model number on the label identifies the model 30 system and the VS42S-xx model number identifies the model 40 system.

The system box contains up to nine field replaceable units (FRUs): the system module, one or two memory modules, a graphics module, a power supply, one of two available mass storage controller (MSC) modules and up to three internal mass storage devices (TZ30 tape drive or an RX23 diskette drive and one or two RZ22 or RZ23 disk drives). There are also three expansion boxes available that contain additional mass storage devices (TK50Z expansion box, RZ55 disk drive expansion box, and an RRD40 compact disc expansion box). The monitor is a VR160 or VR290 color monitor or a VR150 or VR260 monochrome monitor. The keyboard is a LK201 keyboard. Figure 4–1 shows the VS 3100 model 30 system box.

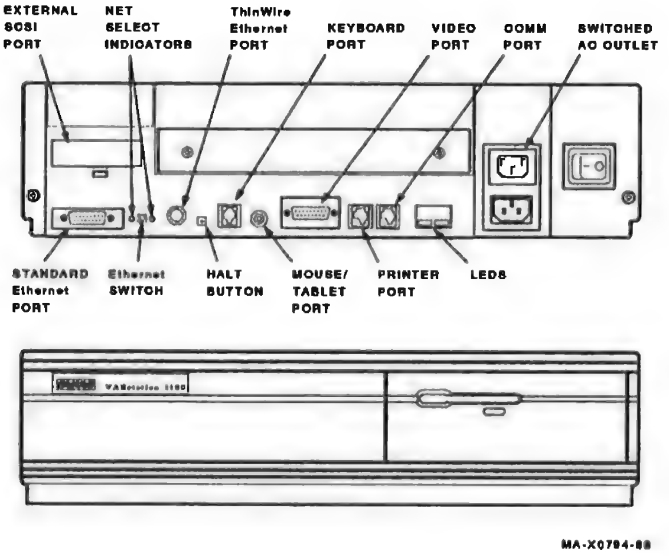


Figure 4–1 Model 30 System Box

The monitor is connected to the 15-pin video port. A printer can be connected to the printer port. A terminal or another printer can be connected to the communication port. Connection to the Ethernet is done through either the ThinWire Ethernet port or the standard Ethernet port depending on which type of Ethernet network is available.

The position of the Ethernet switch determines which of the Ethernet ports provides IEEE 802.3 network communications. An LED is lit next to the enabled port. The keyboard is connected to the keyboard port either on the back of the system box or on the monitor end of the video cable. The mouse or tablet is connected to the mouse port either on the back of the system box or on the monitor end of the video cable. The external SCSI port is for connecting external mass storage devices to the system. The monitor or an external mass storage device can be plugged into the switched ac outlet.

4.2 FRU Removal and Replacement

This section describes the removal and replacement procedures for the FRUs in the VS 3100 model 30 system. To use this section, find the name of the FRU that needs replacing in Table 4–1, then go to the section listed beside the FRU. Follow the steps in the section to remove the FRU and reverse the procedures to replace the FRU. Always test the replaced device for proper operation.

CAUTION

Wear a static wrist strap and use a static mat when replacing FRUs.

Table 4–1 FRU Section Listings

FRU	Section
Battery pack	4.2.10
Keyboard	4.2.12
Mass storage controller (MSC) module	4.2.3
Memory module	4.2.8
Mouse and tablet	4.2.13
8-plane graphics coprocessor option	4.2.7
Power supply	4.2.11
System module	4.2.9
RX23 diskette drive	4.2.6
TZ30 tape drive	4.2.5
RZ22 or RZ23 disk drive	4.2.4

The FRUs for the VR150/VR260 monochrome monitor and the VR160/VR290 color monitors are not covered in this guide. This information is contained in the pocket service guides listed in Table 4–2.

Table 4–2 VR150, VR160, VR260, and VR290 Monitors

Monitor	Document Title	Order Number
VR150	VR150 Pocket Service Guide	EK-VR150-PS
VR160	VR160 Pocket Service Guide	EK-VR160-PS
VR260	VR260 Maintenance Advisory	EK-VR260-PS
VR290	VR290 Service Guide	EK-VR290-SV

Figure 4–2 shows the FRU locations.

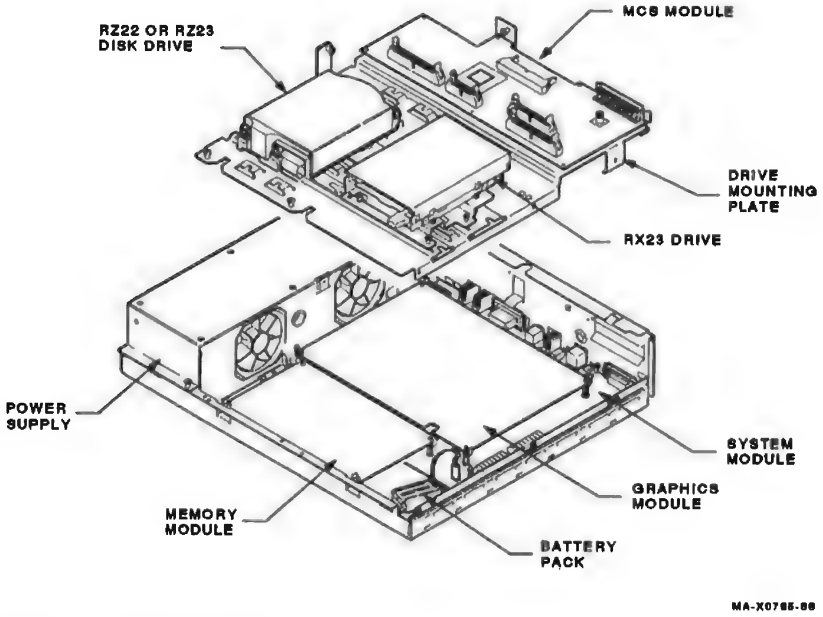


Figure 4–2 FRU Locations

4.2.1 System Box Cover Removal

1. Turn the system power switch off.

2. Unscrew the two cover screws (Figure 4–3).

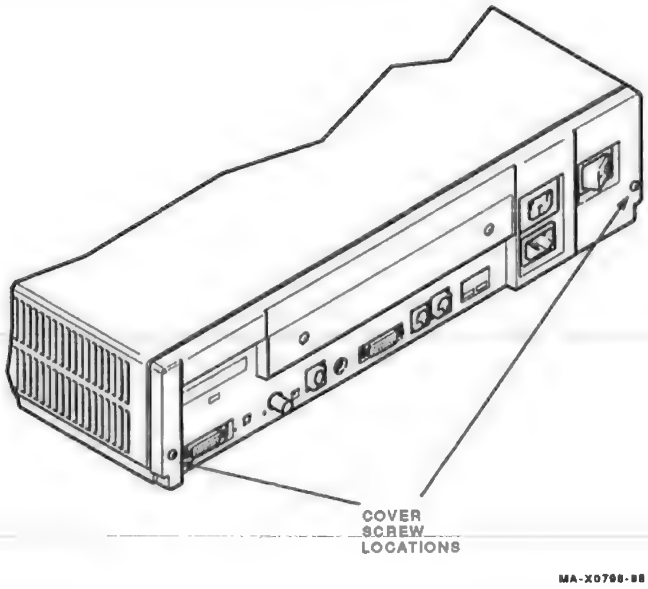


Figure 4–3 Cover Screw Locations

3. Slide the cover forward and up off the system box.

4.2.2 Drive Mounting Panel Removal

1. Remove the system box cover (Section 4.2.1).
2. Disconnect the power cable from the power supply and disconnect the MSC cable (Figure 4–4 for a ST506/SCSI MSC module) or (Figure 4–5 for a SCSI/SCSI MSC module).

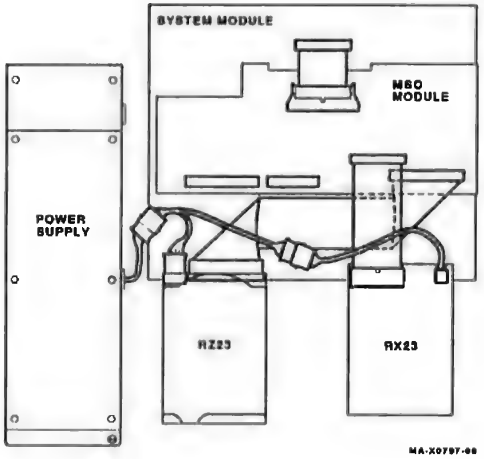


Figure 4–4 Disconnecting the Drive Mounting Panel (ST506/SCSI)

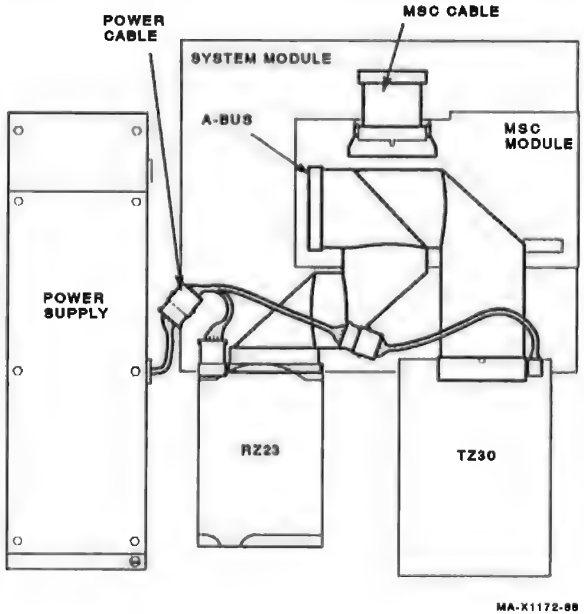


Figure 4–5 Disconnecting the Drive Mounting Panel (SCSI/SCSI)

3. Disconnect the external SCSI cable or the terminator from the SCSI port.

4. Unscrew the seven screws (Figure 4–6).

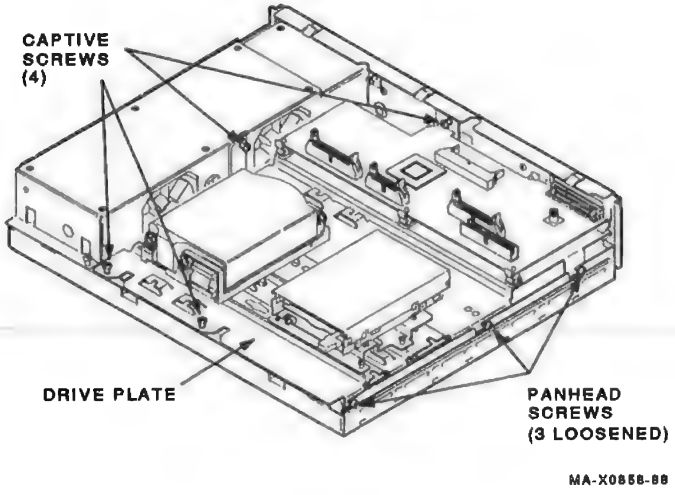


Figure 4–6 Removing the Drive Mounting Panel

5. Slide the panel forward (with the drives), then lift the panel from the system box and set it aside.

   NOTE

   When reinstalling the drive mounting panel, be sure that the system box is sitting on a flat surface, otherwise the panel's screws may not line up properly.

6. Return to the procedure that sent you to this procedure.

4.2.3 Mass Storage Controller (MSC) Module Removal

There are two MSC modules available in the model 30 system. One is the ST506/SCSI MSC module and the other is the SCSI/SCSI MSC module. Remove and replace both modules using the following procedure. Differences between the two modules are listed where necessary.

1. Remove the system box cover (Section 4.2.1).
2. On the ST506/SCSI MSC module, disconnect the MSC cable, the RX23 data cable (if installed), and the SCSI bus cable (if any SCSI drives are installed) from the MSC module (Figure 4–7). Also disconnect the external SCSI cable or the terminator from the external SCSI port.

3. On the SCSI/SCSI MSC module, disconnect the MSC cable and the two SCSI bus cables (if any SCSI drives are installed) from the MSC module (Figure 4–8). Also disconnect the external SCSI cable or the terminator from the external SCSI port.

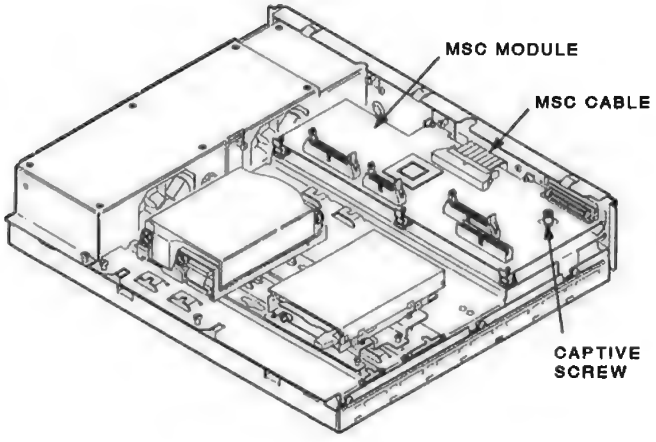


Figure 4–7 Removing the ST506/SCSI MSC Module

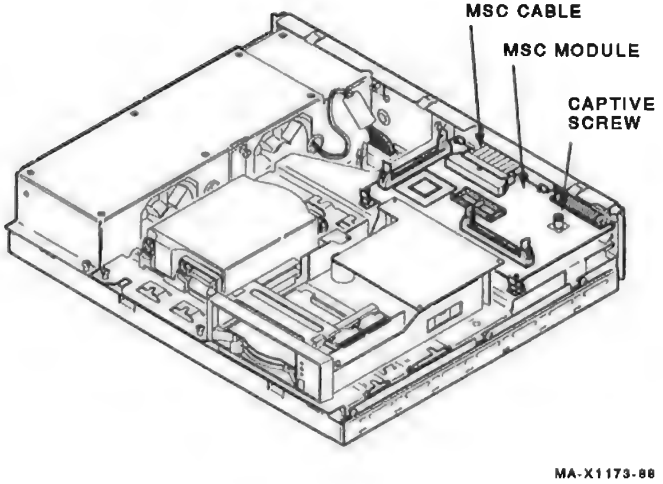


Figure 4–8 Removing the SCSI/SCSI MSC Module

4. Unscrew the captive grounding screw on the MSC module (Figure 4–7).

5. Remove the MSC module from the drive mounting panel. Figure 4–9 shows the connector locations on the ST506/SCSI MSC module and Figure 4–10 shows the connector locations on the SCSI/SCSI MSC module for reference.

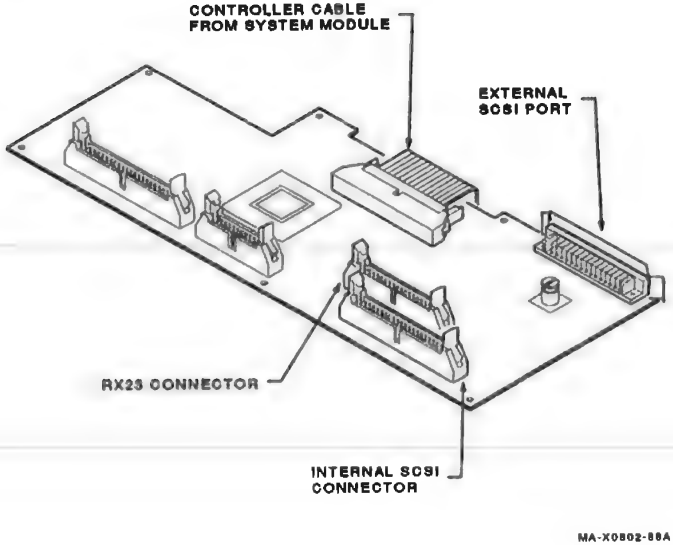


Figure 4–9 ST506/SCSI MSC Module Connectors

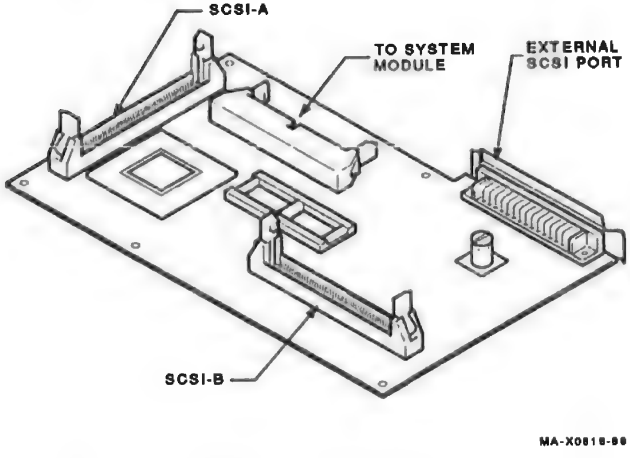
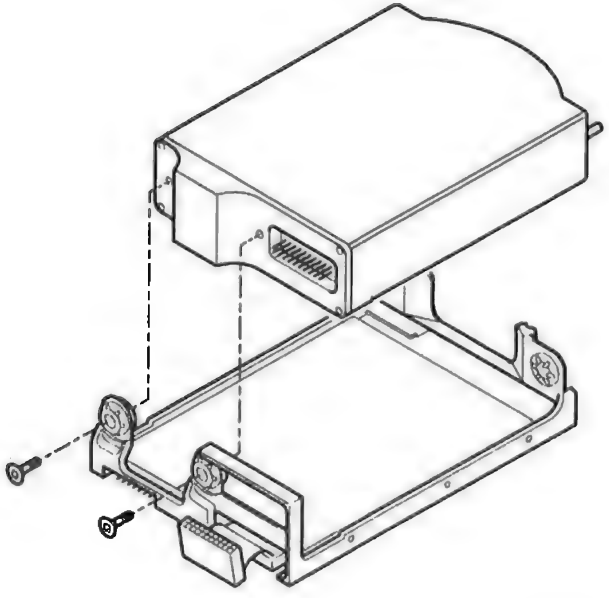


Figure 4–10 SCSI/SCSI MSC Module Connectors

4.2.4 RZ22 and RZ23 Disk Drive Removal

The RZ22 and RZ23 drives contain an internal FRU called the drive module/frame. You must always replace the drive module/frame first before replacing the whole drive. If replacing the drive module/frame did not fix the fault in the drive, you must replace the drive as one FRU since the head/disk assembly (HDA) is not a separate FRU. The following procedure describes how to remove the drive from the system and also how to remove and replace the drive module/frame on the RZ22 or RZ23 drive.

1. Remove the system box cover (Section 4.2.1).
2. Remove the drive mounting panel (Section 4.2.2).
3. Disconnect the SCSI bus data cable from the back of the RZ22 or RZ23 drive you are removing.
4. Turn the drive mounting panel over and remove the four screws from the drive. Support the drive with one hand when removing the last screw.
5. Disconnect the drive interconnect cable and remove the two screws with an 1/8 inch Allen wrench (Figure 4–11).



TTB_X1238_88
MA-X1040-88

Figure 4–11 Removing the HDA

6. Push the HDA back against the rubber stops, then lift up the front of the HDA and remove it from the frame.
7. Slide the HDA into the rubber stops on the new drive module/frame.
8. Screw in the two new screws supplied.
9. Position the jumpers on the new drive module to the same position as they were on the old drive module you just removed (Figure 4–12).

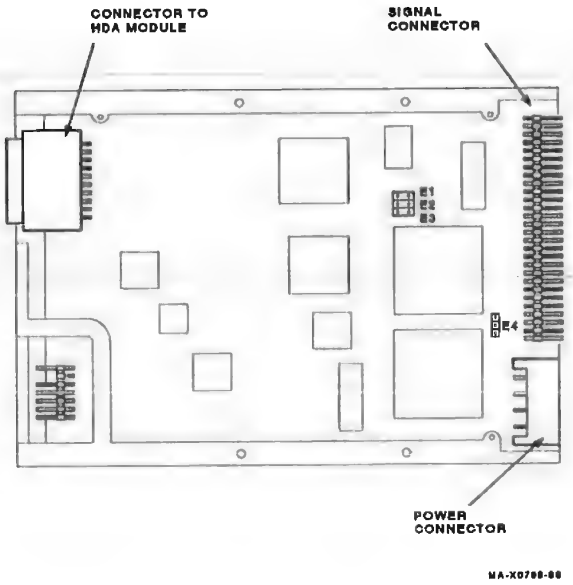


Figure 4–12 RZ22 and RZ23 SCSI Address Jumpers

4.2.5 TZ30 Tape Drive Removal

1. Remove the system box cover (Section 4.2.1).
2. Remove the drive mounting panel (Section 4.2.2).
3. Disconnect the SCSI bus cable from the back of the TZ30.
4. Turn the drive mounting panel over and remove the four screws from the TZ30. Support the TZ30 with one hand when you remove the last screw.

5. Position the switches on the right side of the new TZ30 to the same position as on the old TZ30 you just removed. Usually, the switches are set (Figure 4–13).

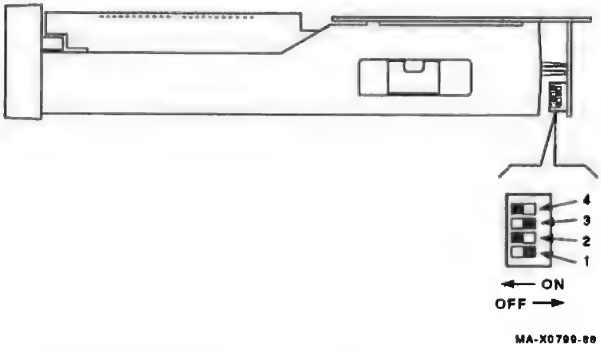


Figure 4–13 TZ30 Jumper Switch Location

4.2.6 RX23 Diskette Drive Removal

1. Remove the system box cover (Section 4.2.1).
2. Disconnect the power cable and the data cable from the back of the RX23.
3. Unscrew the four screws from the RX23's mounting bracket and lift the bracket off the drive plate.
4. Remove the four screws from the RX23's mounting bracket (Figure 4–14).

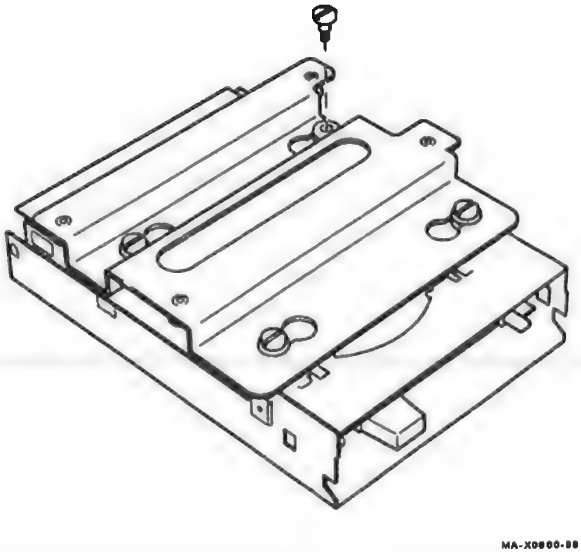


Figure 4–14 RX23 Mounting Bracket Screws

5. Position the select switch on the new drive to the same position as on the old drive you just removed. Figure 4–15 shows the switch positions.

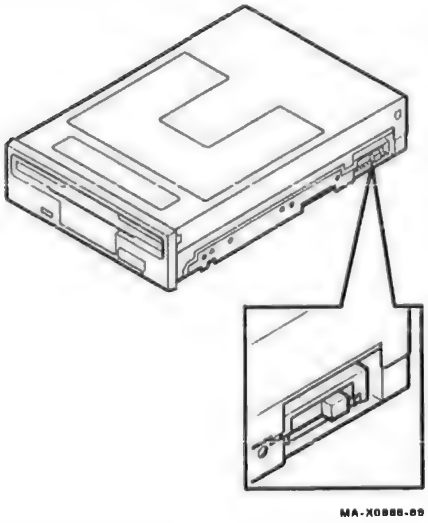


Figure 4–15 RX23 Switch Position

4.2.7 8-Plane Graphics Module Removal

1. Remove the system box cover (Section 4.2.1).
2. Remove the drive mounting panel (Section 4.2.2).
3. Remove the graphics module from the four standoffs, then lift the graphics module off the system module (Figure 4–16). Two connectors disconnect as you lift the graphics module.

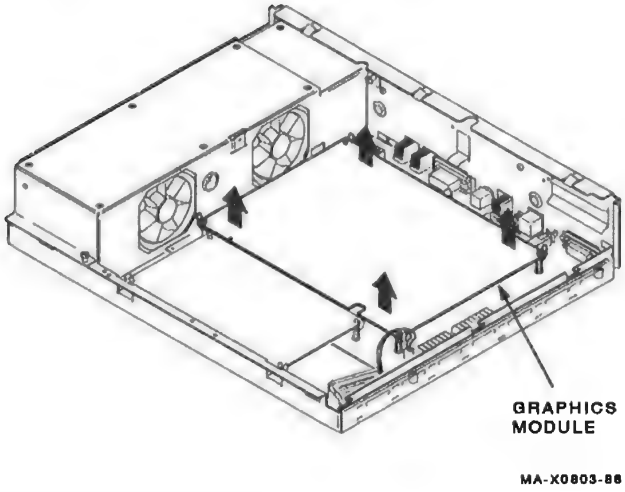


Figure 4–16 Graphics Module Removal

4.2.8 Memory Module Removal

There are three memory modules available; 4 Mbyte, 12 Mbyte, and 16 Mbyte modules. The 4 Mbyte and 12 Mbytes modules are physically the same. The 16 Mbyte module is slightly larger than the other two and it contains two additional connectors for connecting one of the other two memory modules piggyback style. This piggyback connection allows the 4 Mbyte and 12 Mbyte modules to increase the total memory in the system to 24 Mbyte and 32 Mbyte (including 4Mbyte on the system module). Removal procedures for all memory modules are the same. However, you must separate the memory modules if the 16 Mbyte module has a memory module piggybacked on it and replace the faulty module.

1. Remove the system box cover (Section 4.2.1).
2. Remove the drive mounting panel (Section 4.2.2).

3. Remove the memory module from the four standoffs, then lift the memory module off the system module (Figure 4–17). Two connectors disconnect as you lift the module.

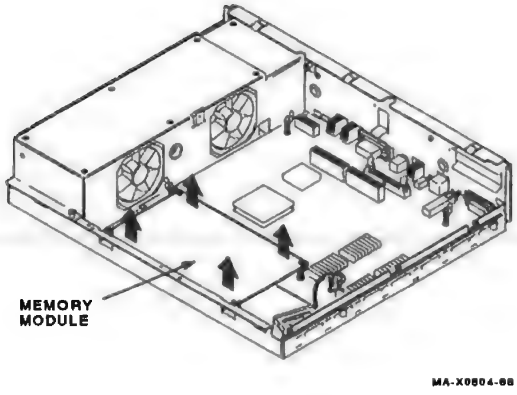


Figure 4–17 Memory Module Removal

4. If the 16 Mbyte memory module is installed and a 4 Mbyte or 12 Mbyte memory module is attached (Figure 4–18), separate the two modules and replace the faulty module. Reassemble the two modules before reinstalling them onto the system module.

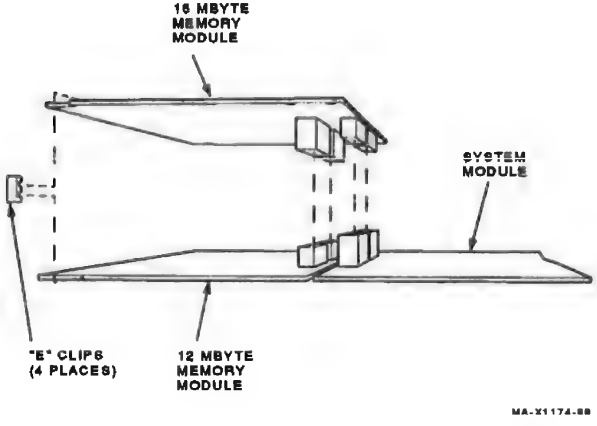


Figure 4–18 16 Mbyte Memory Module

4.2.9 System Module Removal

1. Remove the system box cover (Section 4.2.1).
2. Remove the drive mounting panel (Section 4.2.2).
3. Disconnect all cables from the back of the system box.
4. Remove the memory module from the four standoffs, then lift the memory module off the system module (Figure 4–17). Two connectors disconnect as you lift the module.
5. Remove the graphics module from the four standoffs (if installed), then lift the graphics module off the system module (Figure 4–16). Two connectors disconnect as you lift the module.
6. Disconnect the power cable and the battery cable from the system module (Figure 4–19).

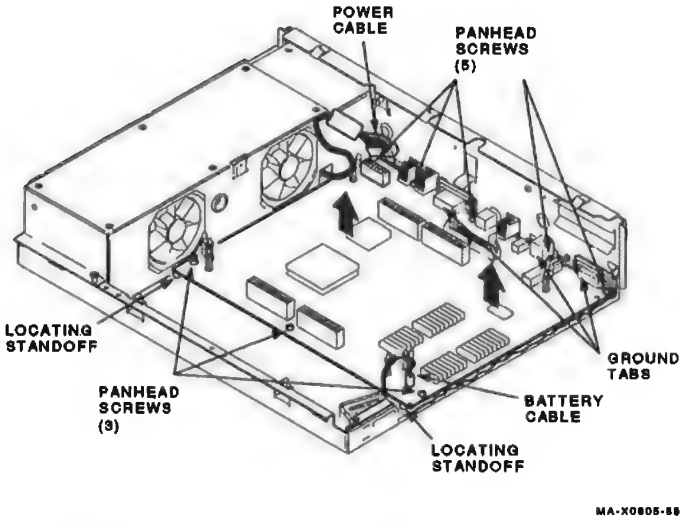


Figure 4–19 System Module Screw Locations

7. Remove the eight screws from the system box (Figure 4–19).
8. Remove the system module by carefully popping the two front corners off of the two locating standoffs.

NOTE

When reinstalling the system module, install the connector end first through the openings in the rear of the box. Push the module back to load the connector ground tabs and then snap the module onto both locating standoffs. All screw holes will then be aligned.

CAUTION

During the next step, be careful not to bend the pins on the Ethernet ID ROM.

9. Remove the Ethernet ID ROM (Figure 4–20) from the system module you removed. Check the position of pin 1 (notched) on the ROM. Install the ID ROM on the new system module.

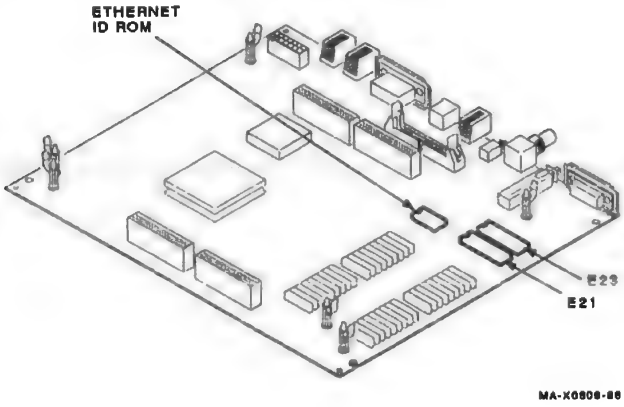


Figure 4–20 Ethernet ID ROM Location on System Module

4.2.10 Battery Pack Removal

1. Remove the system box cover (Section 4.2.1).
2. Remove the drive mounting panel (Section 4.2.2).
3. Disconnect the battery cable from the system module (Figure 4–21).

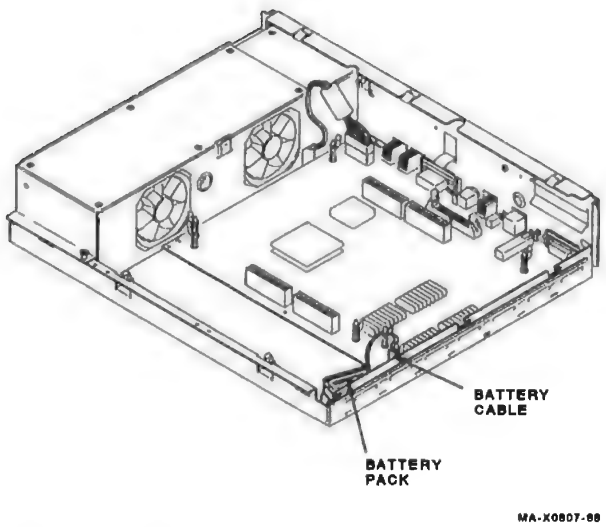


Figure 4–21 Battery Cable Location

4. Remove the battery pack from its holder.

NOTE

A new battery needs a minimum of 25 hours of continuous power to fully charge the battery. If the battery's charge is low, you will see an error for the NVR (0000.0005) when you power up the system.

4.2.11 Power Supply Removal

1. Remove the system box cover (Section 4.2.1).
2. Remove the drive mounting panel (Section 4.2.2).
3. Disconnect the power cable from the system module.

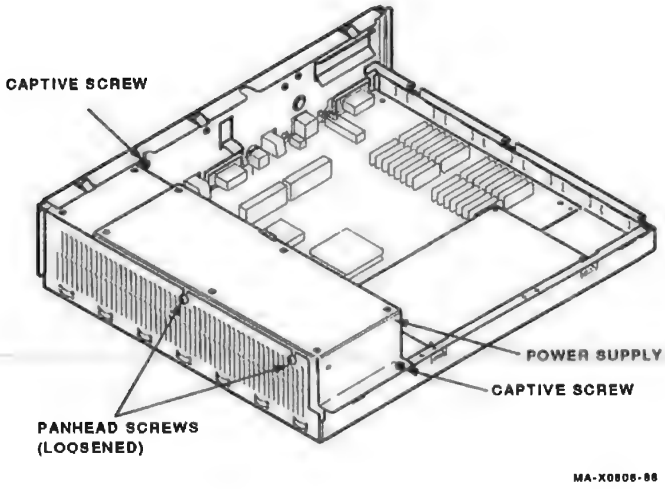


Figure 4–22 Power Supply Screw Locations

4. Unscrew the four screws (Figure 4–22).
5. Lift the power supply out of the system box.

4.2.12 Keyboard Disconnection

CAUTION

Do not remove or unplug the keyboard or the mouse or tablet device without turning off the power.

Unplug the keyboard cable from the rear of the system box or from the monitor end of the video cable (Figure 4–23).

NOTE

The keyboard is a single FRU. Do not try to remove the keycaps or disassemble the keyboard.

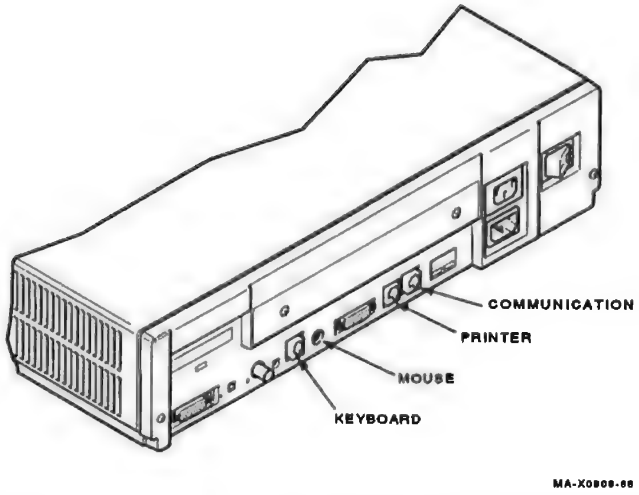


Figure 4–23 Keyboard, Mouse or Tablet, and Printer Disconnection

4.2.13 Mouse and Tablet Disconnection

Disconnect the mouse or tablet from the back of the system box or from the monitor end of the video cable (Figure 4–23).

NOTE

The mouse and the tablet are single FRUs. Do not try to disassemble them.

4.2.14 Printer Disconnection

1. Switch off the printer's power switch.
2. Disconnect the cable from the back of the system box (Figure 4–23) or from the back of the printer.
3. Refer to the printer's pocket service guide for troubleshooting and removal and replacement procedures for the printer.

4.3 Options

This section describes the options available on the VS 3100 system.

4.3.1 Internal Memory Options

Three memory modules are available: a 4 Mbyte memory module, a 12 Mbyte memory module, and a 16 Mbyte memory module. Only one memory module can be plugged into the system module unless the 16 Mbyte memory module is installed which allows one of the 4 Mbyte or 12 Mbyte memory modules to be plugged into the 16 Mbyte memory module piggyback style. With the 16 Mbyte module plugged into the system module, a total of 24 Mbyte or 32 Mbyte memory is possible (4 on the system module and the 12 Mbyte module piggybacked on the 16 Mbyte module = 32 Mbytes).

4.3.2 Graphics Coprocessor Options

The 8-plane graphics module is in the system box and plugs directly into the system module.

4.3.3 Mass Storage Controller Module Options

The MSC module is an option on systems which are diskless. Diskless systems can be upgraded with storage devices. The MSC module is on the lower drive plate and connects to the system module through a cable.

5

VS 3100 (Model 40) System

5.1 Enclosure Description

The model 40 version (VS42S-xx) of the VS 3100 consists of the system box, monitor, mouse, and keyboard. The label on the back of the system box indicates which model you are working on. The VS42S-xx model number on the label identifies the model 40 and the VS42A-xx model number identifies the model 30 systems.

The system box contains up to 10 field replaceable units (FRUs): the system module, memory module, graphics module, power supply, a mass storage controller (MSC) module and up to five internal mass storage devices (TZ30 tape drive, RRD40 compact disc drive, and three RZ23 disk drives). There are also three expansion boxes available that contain additional mass storage devices (TK50Z expansion box, RZ55 disk drive expansion box, and an RRD40 compact disc expansion box).

The monitor is a VR160 or VR290 color monitor or a VR150 or VR260 monochrome monitor. The keyboard is a LK201 keyboard. Figure 5–1 shows the model 40 system box.

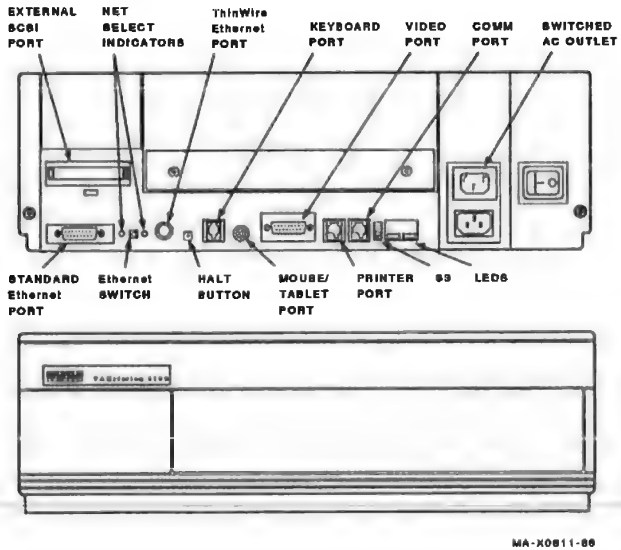


Figure 5–1 Model 40 System Box

The monitor is connected to the 15-pin video port. A printer can be connected to the printer port. A terminal or another printer can be connected to the communication port. Connection to the Ethernet is done through either the ThinWire Ethernet port or the standard Ethernet port depending on which type of Ethernet network is available.

The position of the Ethernet switch determines which of the Ethernet ports provides IEEE 802.3 network communications. An LED is lit next to the enabled port. The keyboard is connected to the keyboard port either on the back of the system box or on the monitor end of the video cable. The mouse or tablet is connected to the mouse or tablet port either on the back of the system box or on the monitor end of the video cable. The external SCSI port is for connecting external mass storage devices to the system. The S3 is used when an alternate console terminal is needed. The monitor or an external mass storage device can be plugged into the switched ac outlet.

5.2 FRU Removal and Replacement

This section describes the removal and replacement procedures for the FRUs in the VS 3100 (model 40) system. To use this section, find the name of the FRU that needs replacing in Table 5–1 then go to the section listed beside the FRU. Follow the steps in the section to remove the FRU and reverse the procedures to replace the FRU. Always test the replaced device for proper operation.

CAUTION

Wear a static wrist strap and use a static mat when replacing FRUs.

Table 5–1 FRU Section Listings

FRU	Section
Battery pack	5.2.10
Keyboard	5.2.12
Mass storage controller (MSC) module	5.2.3
Memory module	5.2.8
Mouse and tablet	5.2.13
8-plane graphics coprocessor option	5.2.7
Power supply	5.2.11
System module	5.2.9
TZ30 tape drive	5.2.5
RZ23 disk drive	5.2.4
RRD40 compact disc drive	5.2.6
RRD40 adapter board	5.2.6

The FRUs for the VR150/VR260 monochrome monitor and the VR160/VR290 color monitors are not covered in this guide. This information is contained in the pocket service guides listed in Table 5–2.

Table 5–2 VR150, VR160, VR260, and VR290 Monitors

Monitor	Document Title	Order Number
VR150	VR150 Pocket Service Guide	EK-VR150-PS
VR160	VR160 Pocket Service Guide	EK-VR160-PS
VR260	VR260 Maintenance Advisory	EK-VR260-PS
VR290	VR290 Service Guide	EK-VR290-SV

Figure 5–2 shows the locations of the FRUs.

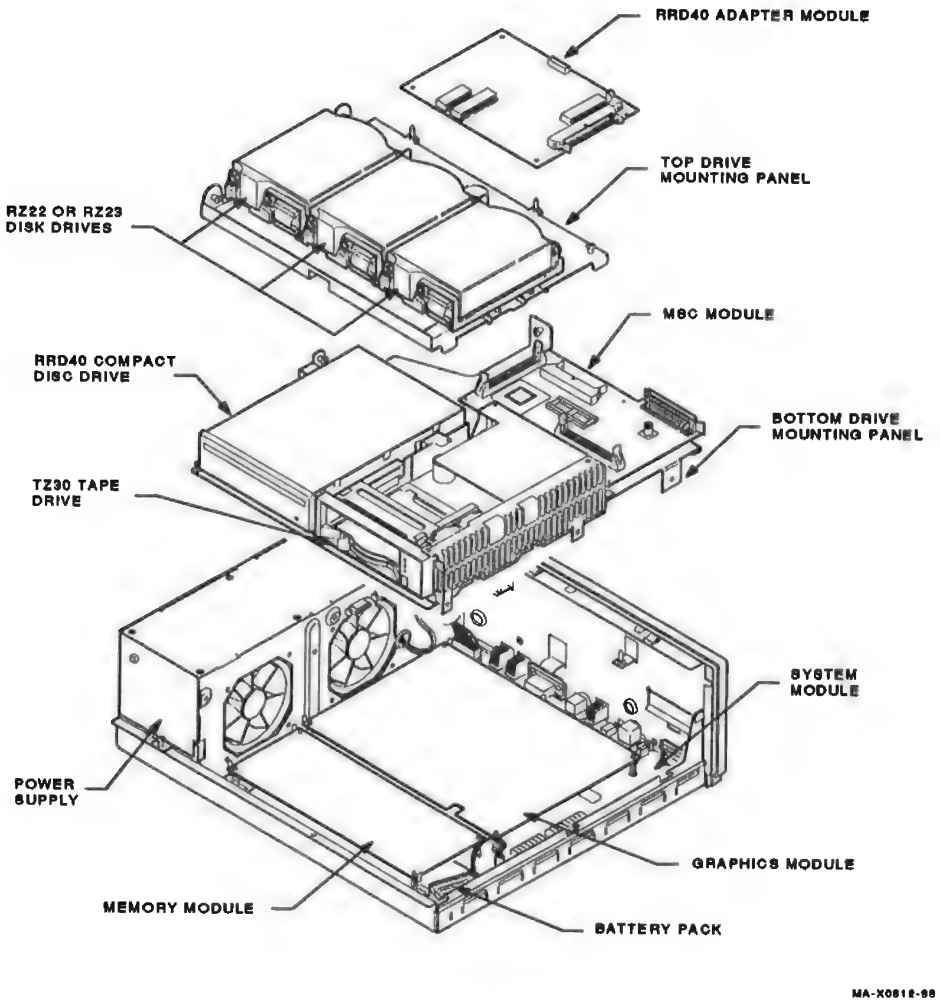


Figure 5–2 FRU Locations

5.2.1 System Box Cover Removal

1. Turn the system power switch off.

2. Remove the two cover screws (Figure 5–3).

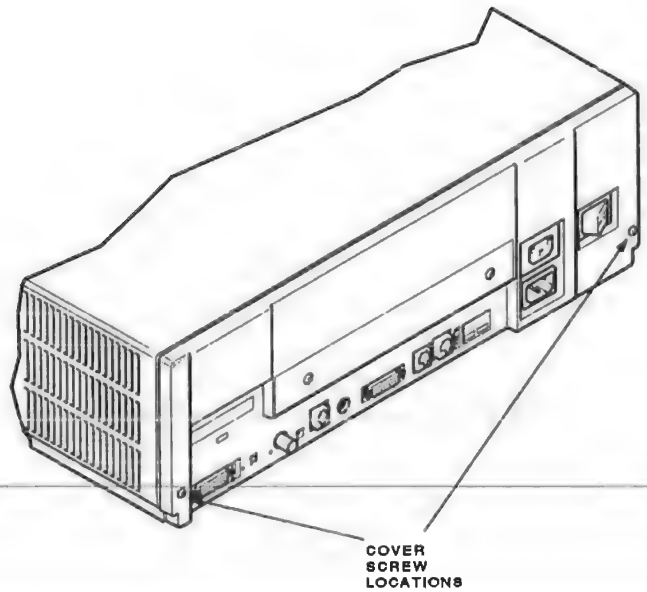


Figure 5–3 Cover Screw Locations

3. Slide the cover forward and up off the system box.

5.2.2 Drive Mounting Panel Removal

The drive mounting panel consists of two separate panels. The top panel contains the three RZ23 disk drives and the lower panel contains the RRD40 compact disc drive and the TZ30 tape drive. The top panel must be removed before the lower panel can be removed. Both panels must be removed to remove the system module, graphics module, memory module, or the power supply. The following procedure describes how to remove both the top and lower drive mounting panels.

1. Remove the system box cover (Section 5.2.1).

CAUTION

You must note which cables connect to which drive when disconnecting them from the system. Write the type of drive and its position on a piece of tape and wrap the tape around the connector before disconnecting it. This will help you when reinstalling the drives.

2. Disconnect the power cables and the SCSI bus cables from the drives on the top panel (Figure 5–4). Also disconnect the SCSI bus cable from the RRD40 adapter board (if installed).

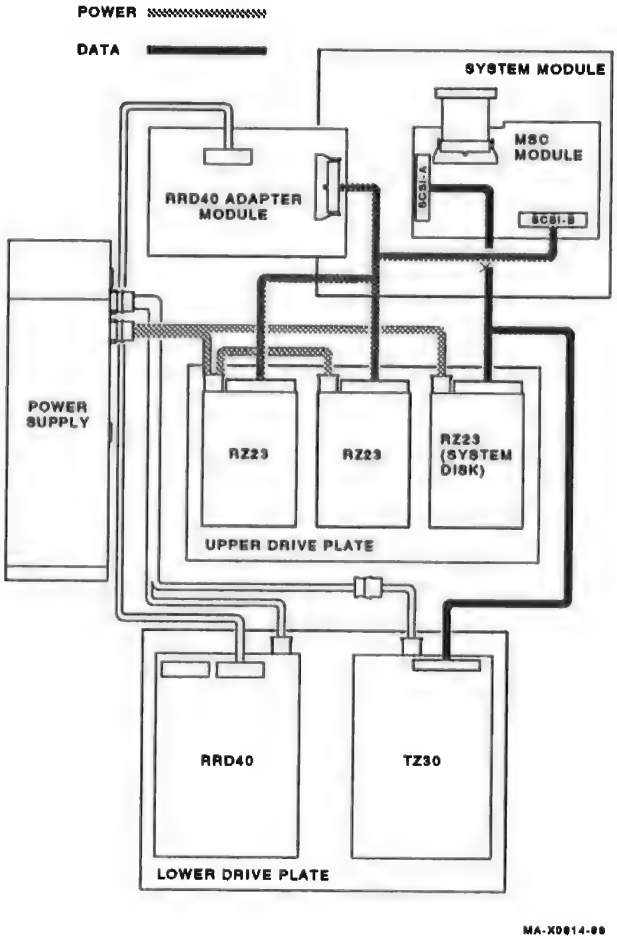


Figure 5–4 Top Drive Mounting Panel Cabling

3. Remove the RRD40 adapter module from the four standoffs and let it hang over the back of the system box.

4. Unscrew the five screws (Figure 5–5).

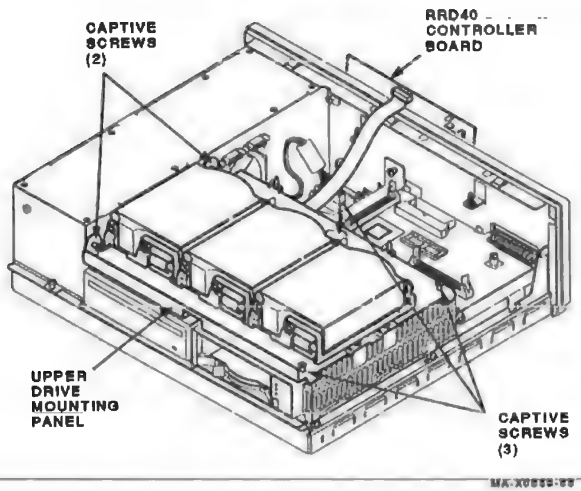


Figure 5–5 Unscrewing the Top Drive Mounting Panel

5. Lift the top panel from the lower panel and set it aside. Stop here and return to the procedure that sent you here if you only needed the top panel removed. Continue with this procedure if you need the bottom panel removed.

6. Disconnect the data cable from the rear of the RRD40 compact disc drive (if installed) and set the RRD40 adapter board aside.

7. Disconnect the power cables from the drives on the lower drive mounting panel and disconnect the MSC cable (Figure 5–6).

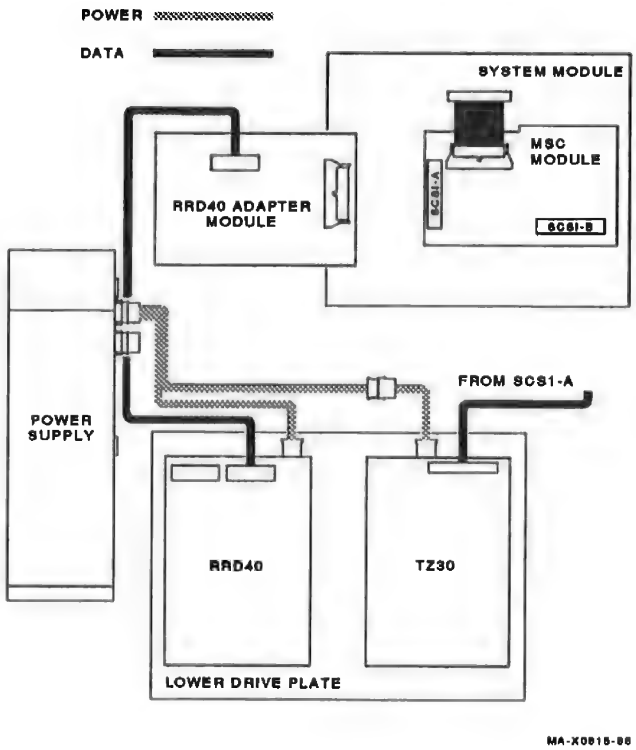


Figure 5–6 Lower Drive Mounting Panel Cabling

8. Unscrew the seven screws (Figure 5–7).

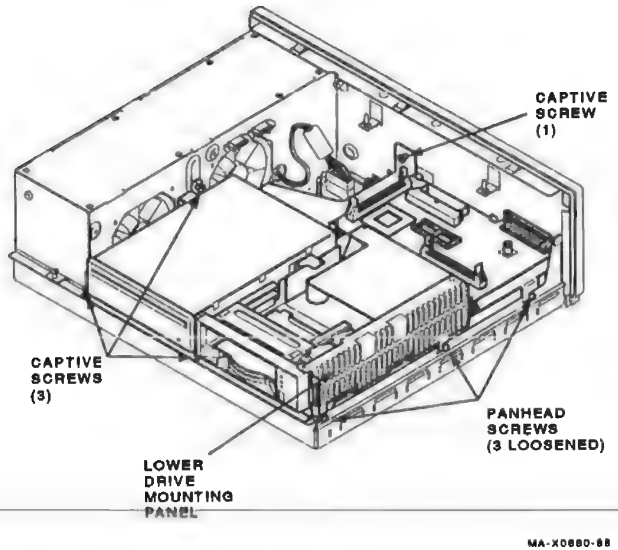


Figure 5–7 Unscrewing the Lower Drive Mounting Panel

9. Slide the panel forward (with the drives) then lift the panel from the system box and set it aside.
10. Return to the procedure that sent you to this procedure.

5.2.3 Mass storage Controller (MSC) Module Removal

1. Remove the system box cover (Section 5.2.1).
2. Disconnect the SCSI bus cable from the RRD40 adapter board.
3. Lift the RRD40 adapter board off the standoffs and let it hang over the back of the system box.
4. Disconnect the MSC cable and the two SCSI bus cables from the MSC module (Figure 5–8).
5. Unscrew the captive grounding screw on the MSC module (Figure 5–8).

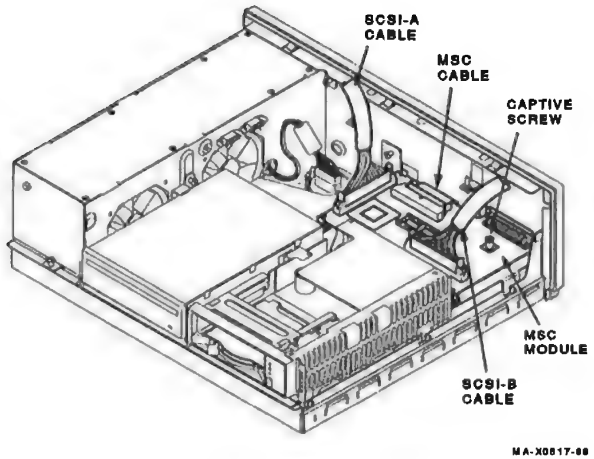


Figure 5–8 Removing the MSC Module

6. Remove the MSC module from the drive mounting panel. Figure 5–9 shows the connector locations on the MSC module for reference.

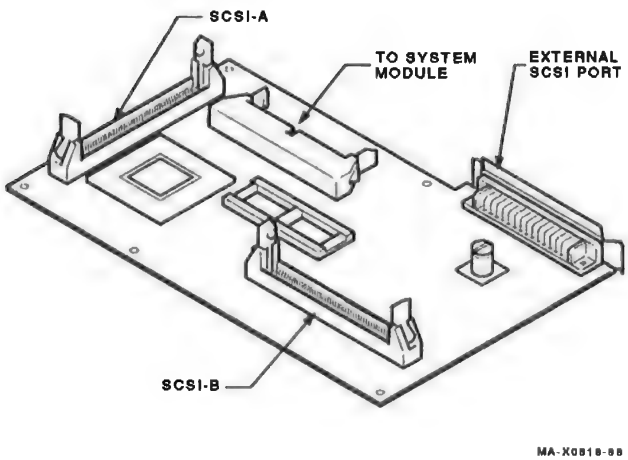


Figure 5–9 MSC Module Connectors

5.2.4 RZ23 Disk Drive Removal

The RZ23 drives are installed on the top drive mounting panel. One of the drives is the system disk and connects to the SCSI-A bus while the other two are user disks and connect to the SCSI-B bus. They contain an internal FRU called the drive module/frame. Once you remove the drive from the system, you must always replace the drive module/frame first before replacing the whole drive. If replacing the drive module/frame did not fix the fault in the drive, you must replace the drive as one FRU since the head/disk assembly (HDA) is not a separate FRU. The following procedure describes how to remove the drive from the system and how to remove and replace the drive module/frame.

1. Remove the system box cover (Section 5.2.1).
2. Remove the top drive mounting panel (Section 5.2.2).
3. Turn the drive mounting panel over and remove the four screws from the drive. Support the drive with one hand when removing the last screw.
4. Disconnect the drive interconnect cable and remove the two screws with an 1/8 inch Allen wrench (Figure 5–10).

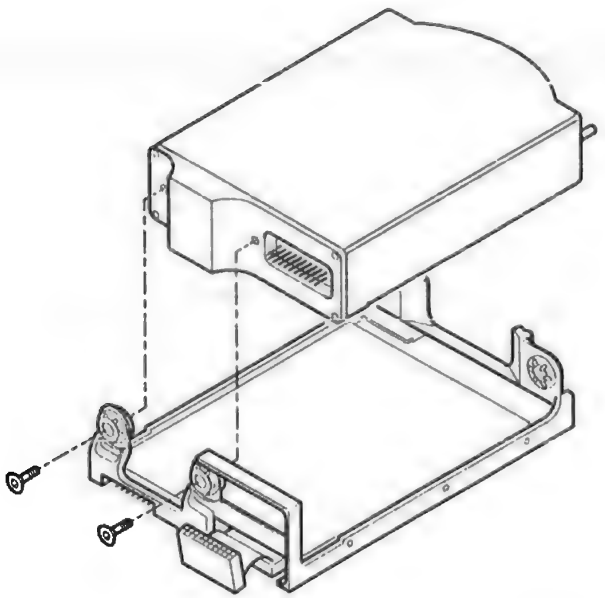


Figure 5–10 Removing the HDA

5. Push the HDA back against the rubber stops then lift up the front of the HDA and remove it from the frame.
6. Slide the HDA into the rubber stops on the new drive module/frame.
7. Screw in the two new screws supplied.
8. Position the jumpers on the new drive module to the same position as they were on the old drive module you just removed (Figure 5–11).

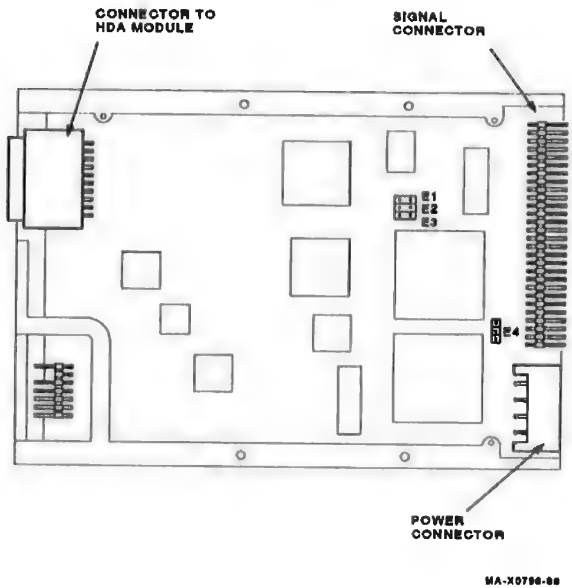


Figure 5–11 RZ23 Jumper Location

5.2.5 TZ30 Tape Drive Removal

The TZ30 tape drive is on the lower drive mounting panel.

1. Remove the system box cover (Section 5.2.1).
2. Remove both of the drive mounting panels (Section 5.2.2).
3. Disconnect the data cable from the back of the TZ30.
4. Turn the drive mounting panel over and remove the four screws from the TZ30. Support the TZ30 with one hand when removing the last screw.

5. Position the switches on the right side of the new TZ30 to the same position as on the old TZ30 you just removed. Usually, the switches are set as shown in Figure 5–12.

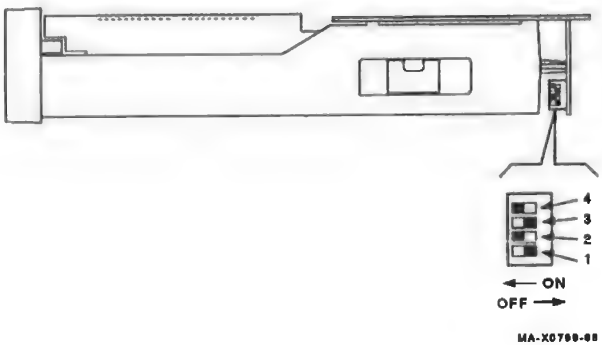


Figure 5–12 TZ30 Jumper Switch Location

5.2.6 RRD40 Compact Disc Drive Removal

The RRD40 compact disc drive subsystem consists of the RRD40 drive and the RRD40 adapter board. The drive is in the left position on the lower drive mounting panel and the RRD40 adapter board is on the back of the top drive mounting panel. The RRD40 adapter board connects to the SCSI bus and a data cable connects the RRD40 drive to the adapter board.

1. Remove the system box cover (Section 5.2.1).
2. Remove both the drive mounting panels (Section 5.2.2).
3. Turn the drive mounting panel over and remove the four screws from the drive. Support the RRD40 drive with one hand when removing the last screw.

   NOTE

   The RRD40 compact disc and the RRD40 adapter board are one FRU and both must be replaced together.

4. Position the switches on the new drive and the new adapter board to the same position as on the old drive and old adapter board you just removed. Usually, the switches are set as shown in Figure 5–13.

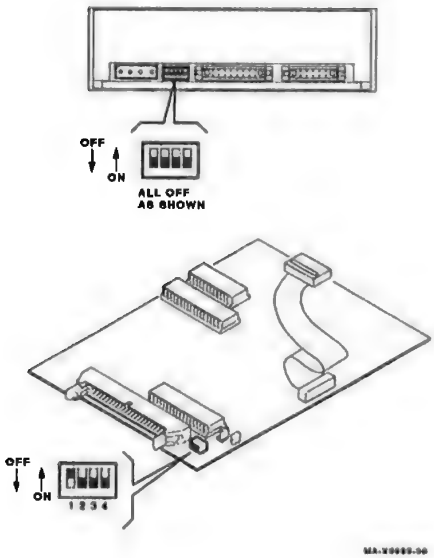


Figure 5–13 RRD40 Jumper Switch Location

5.2.7 8-Plane Graphics Module Removal

1. Remove the system box cover (Section 5.2.1).
2. Remove both of the drive mounting panels (Section 5.2.2).
3. Remove the graphics module from the four standoffs, then lift the graphics module off the system module (Figure 5–14). Two connectors disconnect as you lift the module.

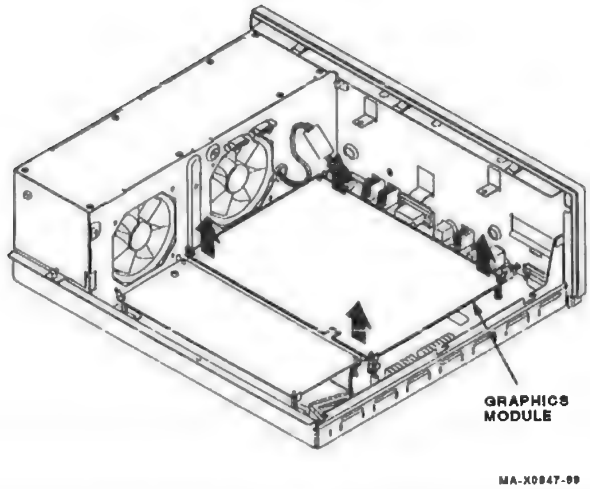


Figure 5–14 Graphics Module Removal

5.2.8 Memory Module Removal

There are three memory modules available: 4 Mbyte, 12 Mbyte, and 16 Mbyte modules. The 4 Mbyte and 12 Mbytes modules are physically the same. The 16 Mbyte module is slightly larger than the other two and it contains two additional connectors for connecting one of the other two memory modules piggyback style. This piggyback connection allows the 4 Mbyte and 12 Mbyte modules to increase the total memory in the system to 24 Mbyte and 32 Mbyte (including 4Mbyte on the system module). Removal procedures for all memory modules is the same. However, you must separate the memory modules if the 16 Mbyte module has a memory module piggybacked on it and replace the faulty module.

1. Remove the system box cover (Section 5.2.1).
2. Remove both of the drive mounting panels (Section 5.2.2).
3. Remove the memory module from the four standoffs, then lift the memory module off the system module (Figure 5–15). Two connectors disconnect as you lift the module.

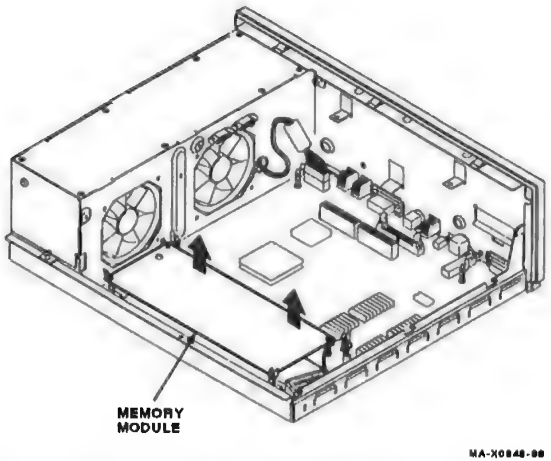


Figure 5–15 Memory Module Removal

4. If the 16 Mbyte memory module is installed and a 4 Mbyte or 12 Mbyte memory module is attached (Figure 5–16), separate the two modules and replace the faulty module. Reassemble the two modules before reinstalling them onto the system module.

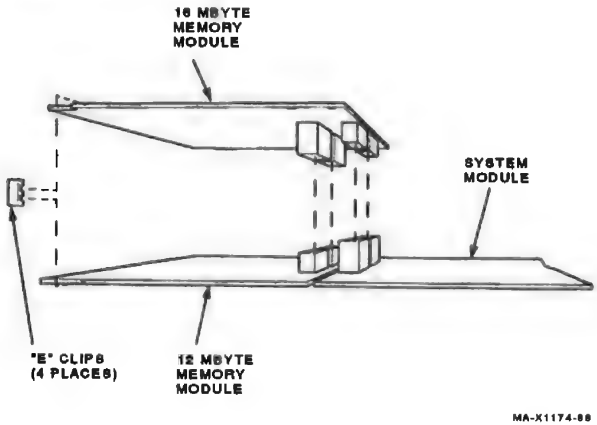


Figure 5–16 16 Mbyte Memory Module

5.2.9 System Module Removal

1. Remove the system box cover (Section 5.2.1).
2. Remove both of the drive mounting panels (Section 5.2.2).
3. Disconnect all cables from the back of the system box.
4. Remove the graphics module from the four standoffs (if installed), then lift the graphics module off the system module (Figure 5–14). Two connectors disconnect as you lift the module.
5. Remove the memory module from the four standoffs, then lift the memory module off the system module (Figure 5–15). Two connectors disconnect as you lift the module.
6. Disconnect the power cable and the battery cable from the system module (Figure 5–17).
7. Remove the eight screws from the system box (Figure 5–17).

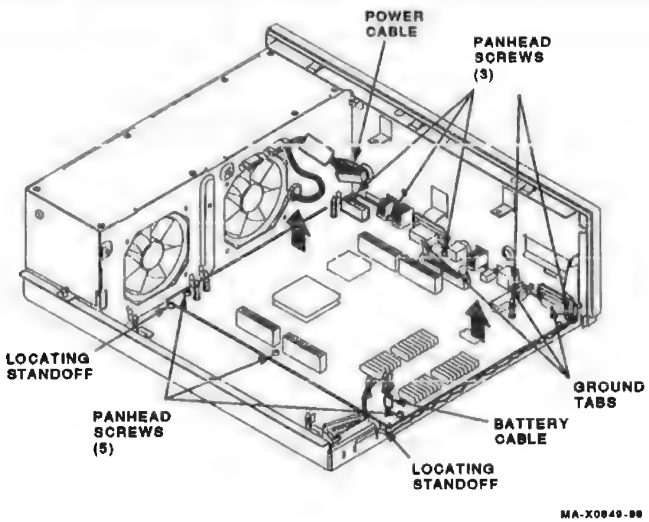


Figure 5–17 System Module Screw Locations

8. Remove the system module by carefully popping the two front corners off of the two locating standoffs.

NOTE

When reinstalling the system module, install the connector end first through the openings in the rear of the box. Push the module back to

load the connector ground tabs and then snap the module onto both locating standoffs. All screw holes will then be aligned.

CAUTION

Be careful not to bend the pins on the ROM.

9. Remove the Ethernet ID ROM (Figure 5–18) from the system module you removed. Check the position of pin 1 (notched) on the ROM. Install the ID ROM on the new system module.

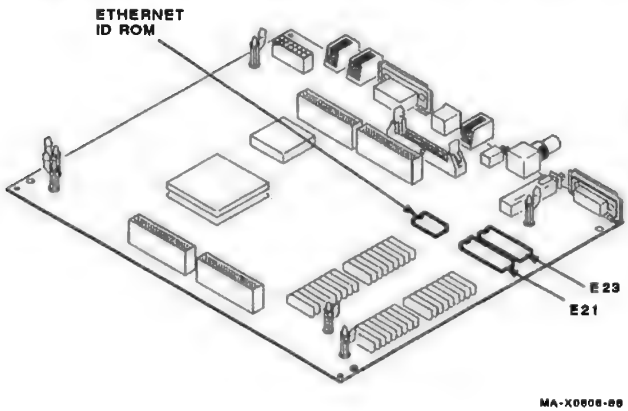


Figure 5–18 Ethernet ID ROM Location on System Module

5.2.10 Battery Pack Removal

1. Remove the system box cover (Section 5.2.1).
2. Remove both of the drive mounting panels (Section 5.2.2).
3. Disconnect the battery cable from the system module (Figure 5–19).

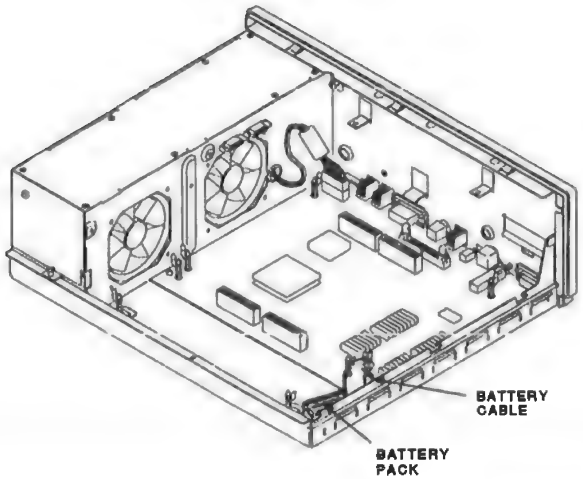


Figure 5–19 Battery Cable Location

4. Remove the battery pack from its holder.

NOTE

A new battery needs a minimum of 25 hours of continuous power to fully charge the battery. If the battery's charge is low, you will see an error for the NVR (0000.0005) when you power up the system.

5.2.11 Power Supply Removal

1. Remove the system box cover (Section 5.2.1).
2. Remove both of the drive mounting panels (Section 5.2.2).
3. Disconnect the power cable from the system module.
4. Unscrew the four screws (Figure 5–20).

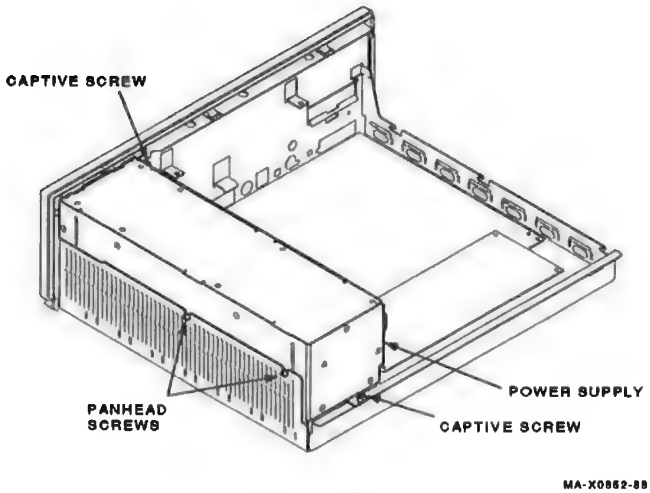


Figure 5–20 Power Supply Screw Locations

5. Lift the power supply out of the system box.
6. Disconnect the two power cables from the old power supply and connect them to the new power supply.

5.2.12 Keyboard Disconnection

CAUTION

Do not remove or unplug the keyboard or mouse or tablet device without turning off the power.

Unplug the keyboard cable from the rear of the system box or from the monitor end of the video cable. Refer to Figure 5–21.

NOTE

The keyboard is a single FRU. Do not try to remove the keycaps or disassemble the keyboard.

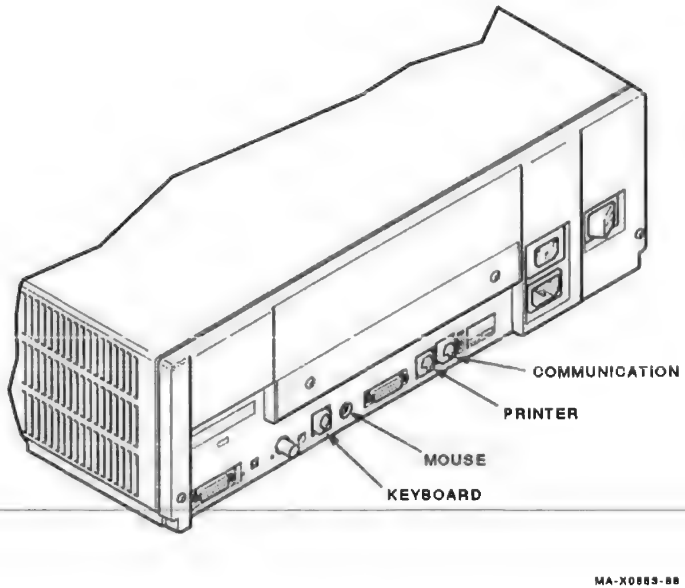


Figure 5–21 Keyboard, Mouse or Tablet, and Printer Disconnection

5.2.13 Mouse and Tablet Disconnection

Disconnect the mouse or tablet from the back of the system box or from the monitor end of the video cable. Refer to Figure 5–21.

NOTE

The mouse and the tablet are single FRUs. Do not try to disassemble them.

5.2.14 Printer Disconnection

1. Switch off the printer's power switch.
2. Disconnect the cable from the back of the system box (Figure 5–21) or from the back of the printer.
3. Refer to the printer's pocket service guide for troubleshooting and removal and replacement procedures for the printer.

5.3 Options

This section describes the options available on the VS 3100 (model 40) system.

5.3.1 Internal Memory Options

Three memory modules are available: a 4-Mbyte memory module, a 12-Mbyte memory module, and a 16 Mbyte memory module. Only one memory module can be plugged into the system module unless the 16 Mbyte memory module is installed which allows one of the 4 Mbyte or 12 Mbyte memory modules to be plugged into the 16 Mbyte memory module piggyback style. With the 16 Mbyte module plugged into the system module, a total of 24 Mbyte or 32 Mbyte memory is possible (4 Mbytes on the system module and the 12 Mbyte module piggybacked on the 16 Mbyte module = 32 Mbytes).

5.3.2 Graphics Coprocessor Options

The 8-plane graphics module is in the system box and plugs directly into the system module.

5.3.3 Mass Storage Controller Module Options

The MSC module is an option on systems which are diskless. Diskless systems can be upgraded with storage devices. The MSC module is on the lower drive plate and connects to the system module through the MSC cable.

6
Expansion Boxes

This chapter describes the three expansion boxes available on the VS 3100 systems. These three expansion boxes are the RZ55 disk, the RRD40 compact disc, and the TK50Z. Table 6–1 lists each expansion box and the section where it is located.

Table 6–1 Expansion Box Section Listing

Expansion Box	Section
TK50Z tape drive expansion box	6.3
RZ55 disk drive expansion box	6.1
RRD40 compact disc expansion box	6.2

6.1 RZ55 Expansion Box

The RZ55 expansion box contains five FRUs: the RZ55 drive, the RZ55 electronics module, the SCSI ID switch module, the power supply, and the resistor load board.

Figure 6–1 shows the RZ55 expansion box.

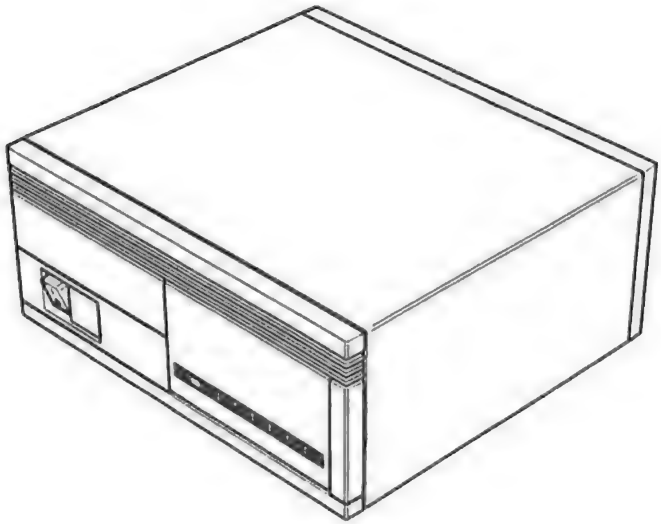


Figure 6–1 RZ55 Expansion Box

MA-X0810-88

The RZ55 expansion box connects to the system box through the external SCSI port. The SCSI cable connects to either of the two ports on the back of the expansion box. However, the SCSI terminator must be installed on the unused connector unless another expansion box is daisy chained. If the SCSI port already has a box connected to it, use another cable to connect the RZ55 expansion box to the last box on the daisy chain. Be sure to move the terminator onto the unused connector on the back of the last expansion box in the daisy chain.

Figure 6–2 and Figure 6–3 show how the RZ55 expansion box connects to the system box.

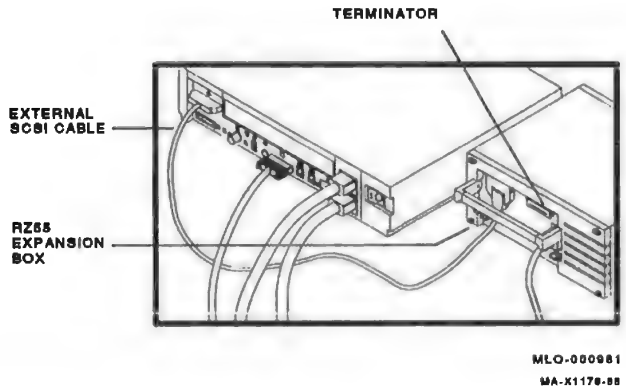


Figure 6–2 RZ55 Expansion Box Connection

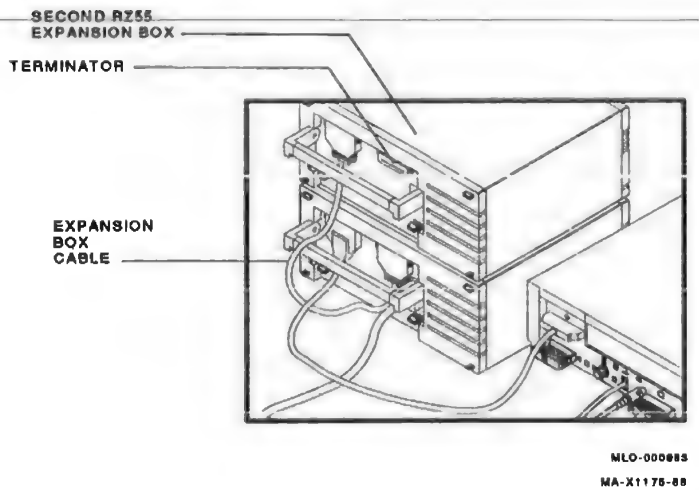


Figure 6–3 RZ55 Expansion Boxes Daisy Chained

One exception is when the TK50Z-FA expansion box connects to the SCSI port (expansion box without a SCSI ID switch on the back of the box, the TK50Z-GA has the switch). The TK50Z-FA expansion box must be disconnected and the RZ55 expansion box must be connected between the external SCSI port and the TK50Z-FA expansion box. The TK50Z-FA expansion box has termination resistors installed inside its box. The TK50Z-FA expansion box must be installed at the end of the daisy chain. The TK50Z-GA expansion box does not have the resistors installed and can be anywhere in the daisy chain.

The TK50Z-GA expansion box must have the SCSI terminator installed if it is the last box in the daisy chain.

6.1.1 Troubleshooting the RZ55 Disk Drive Expansion Box

To troubleshoot the RZ55 disk in the expansion box, use the self-test and system exerciser diagnostics in the system box. Refer to Section 2.15.3 if you are not familiar with testing the devices on the SCSI bus.

Self-test results for the RZ55 disk drive should contain 00000001 in the SCSI address ID location set by the switches on the back of the expansion box (should be ID 1 and/or ID 0). A code of FFFFFF05 for the RZ55 indicates that the device is not installed, not powered up, not connected to the SCSI port properly, or faulty. A code of FFFFFFFF indicates that the device was not tested because of a SCSI bus controller error. Any code other than those previously listed indicates an error with the disk drive at that address ID location, a cabling problem, or an error with the SCSI bus controller on the MSC module. An additional RZ55 drive expansion box can be installed at address ID 2 or 3 if no internal drives connect to these SCSI address IDs on the external SCSI bus.

When running the system exerciser in Field Service mode, the code for the disk drive shows that it is writable and that no errors are present (0200.0001 or 1200.0001 for SCSI IDs of 0 and 1). Any error code other than those previously listed indicates an error is most likely on the disk, but never rule out the possibility of an error on the SCSI bus controller itself.

If the tests indicate an error on the RZ55, perform the following steps:

1. Make sure the expansion box has power and is switched on.
2. Make sure the SCSI port cable connects properly to the external SCSI port on the system box, or to the previous expansion box, and to the back of the RZ55 expansion box.
3. Make sure the SCSI terminator installs on the unused connector on the back of the box or that the cable secures the next daisy-chained box.
4. Run the tests again.
5. If the problem returns, disconnect the RZ55 expansion box from the daisy chain or from the external SCSI port if no other boxes are connected. Install the SCSI terminator on the external SCSI port, make sure the last expansion box is terminated properly, and run self-test (TEST 6).

6. If the status code is not FFFFFF05 for the address ID of the RZ55 expansion box (normally address ID 1 or 0) , check the SCSI address IDs of all drives on the bus for proper settings. If the address IDs are set correctly, replace the MSC module .
7. If the status code is FFFFFF05, check the address ID switch on the back of the RZ55 expansion box to make sure it is set properly. Refer to Figure 6–13 for proper SCSI ID switch settings.
8. If the address ID and drive select jumpers are set properly, a fault in the RZ55 expansion box exists.
9. Remove the cover to the expansion box and check the internal cabling for good connections.
10. Power up the expansion box and listen for the fan and the drive to spin up. If the fan does not spin or the drive does not hum, replace the power supply, reconnect the box to the SCSI port, and retest.
11. If the power supply operates normally, replace the RZ55 electronics module, reconnect the box to the SCSI port, and retest.
12. If replacing the RZ55 electronics module did not fix the problem, replace the whole RZ55 drive, reconnect the box to the SCSI port, and retest.
13. If replacing the RZ55 drive did not fix the problem, replace the SCSI switch module, reconnect the box to the SCSI port, and retest.
14. If replacing the SCSI ID switch module did not fix the problem, replace the resistor load board, reconnect the box to the SCSI port, and retest.
15. If a problem still exists, check the internal SCSI cable's connector for damaged pins or cut wires. Check the external SCSI cable for damaged connector pins or cut wires. Then replace the MSC module in the system box if the cables appear normal.

6.1.2 RZ55 Expansion Box FRU Locations

Figure 6–4 shows the locations of the FRUs in the RZ55 expansion box.

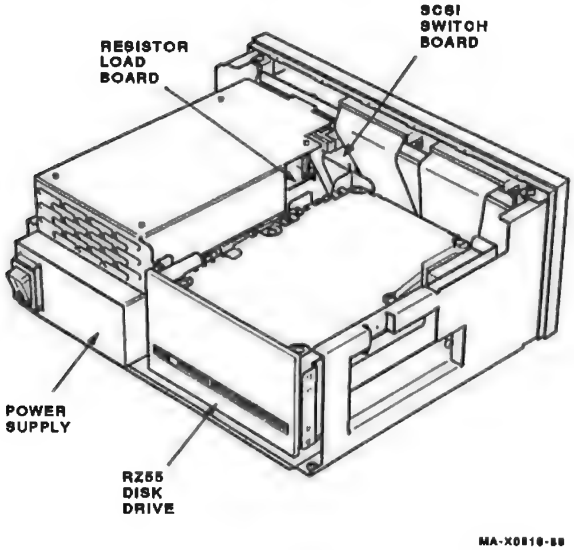


Figure 6–4 RZ55 Expansion Box FRU Locations

6.1.3 RZ55 Expansion Box FRU Removal and Replacement

This section describes the removal and replacement procedures for the FRUs in the RZ55 expansion box. To use this section, find the name of the FRU that needs replacing in Table 6–2, then go to the section listed beside the FRU. Follow the steps in the section to remove the FRU and reverse the procedures to replace the FRU.

CAUTION

Wear a static wrist strap and use a static mat when replacing a FRU.

Table 6–2 RZ55 Expansion Box FRU Section Listings

FRU	Section
Power supply	6.1.3.3
RZ55 disk drive and electronics module	6.1.3.1
Resistor load board	6.1.3.4
SCSI ID switch module	6.1.3.2

6.1.3.1 RZ55 Disk Drive Removal From Expansion Box

The following section describes the removal and replacement procedure for the RZ55 and its electronics module. If you have already replaced the drive's electronics module and a problem still exists, you must replace the whole drive instead of replacing just the following electronics module as described.

1. Switch off power to the expansion box.
2. Unscrew the four cover screws and remove the expansion box cover (Figure 6–5).

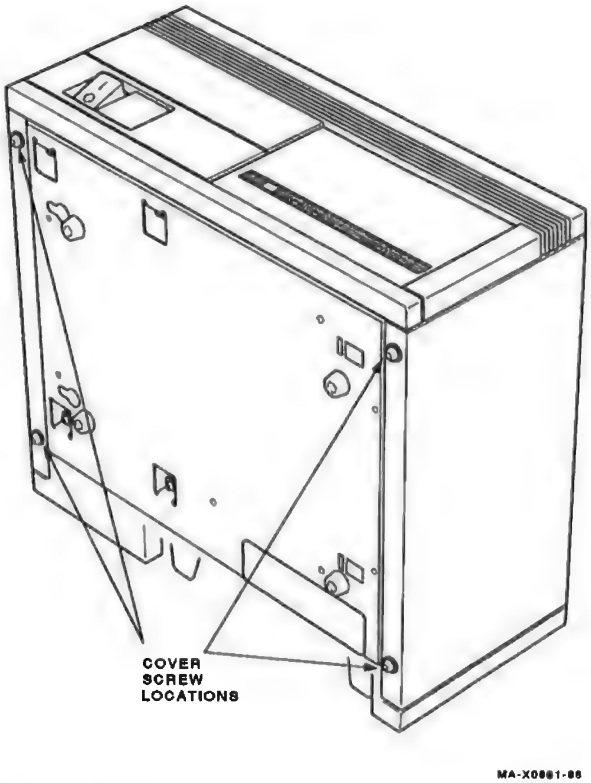


Figure 6–5 RZ55 Expansion Box Cover Screws

3. Remove the three screws (Figure 6–6).

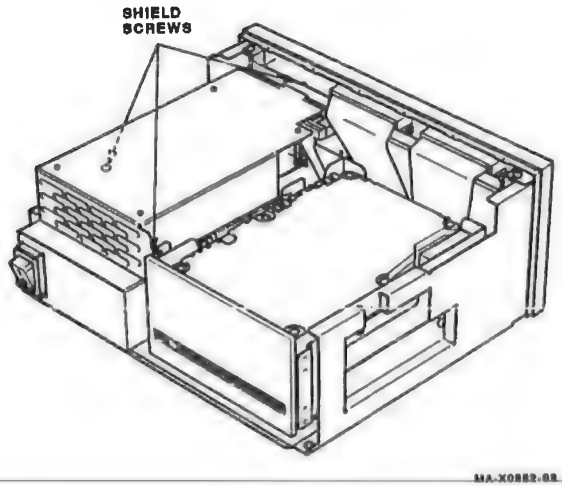


Figure 6–6 RZ55 Expansion Box Shield Screws

4. Lift the shield up, disconnect the power cable from the resistor load board, and remove the shield (with the resistor load board) from the expansion box.

5. Remove the three drive mounting screws (Figure 6–7).

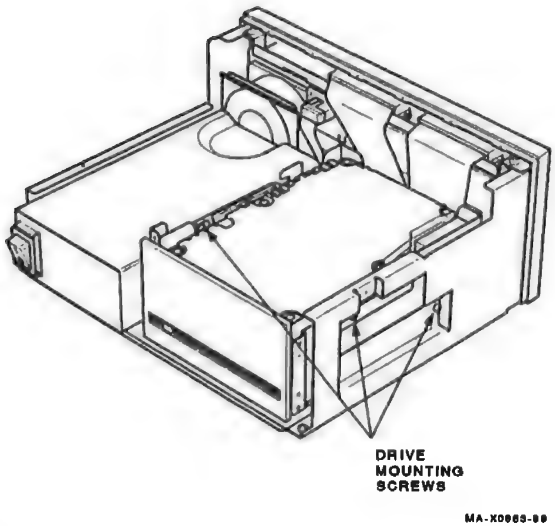


Figure 6–7 RZ55 Expansion Box Drive Mounting Screws

6. Slide the drive out halfway and disconnect the data cable, the SCSI switch cable, and the power cable from the back of the drive, then slide the drive all the way out of the box (Figure 6–8).

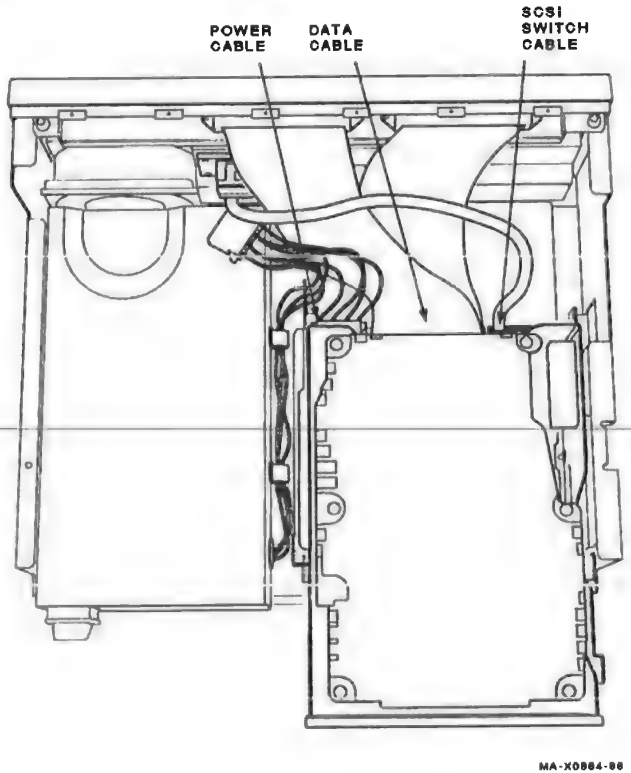


Figure 6–8 RZ55 Expansion Box Drive Cables

7. Remove the four screws (Figure 6–9) and the mounting brackets from the drive.

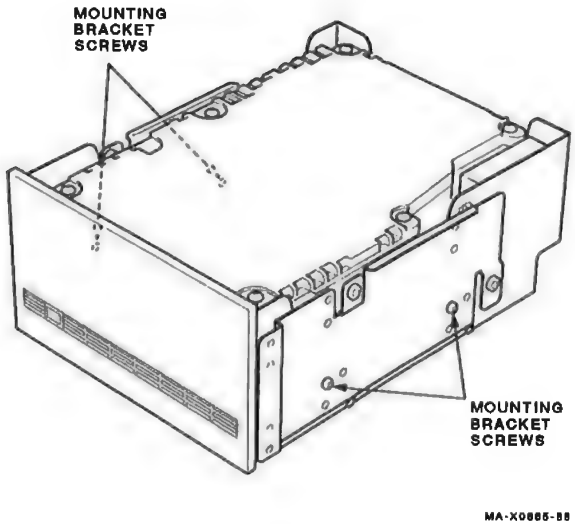


Figure 6–9 RZ55 Mounting Bracket Screws

8. Position the drive (Figure 6–10).

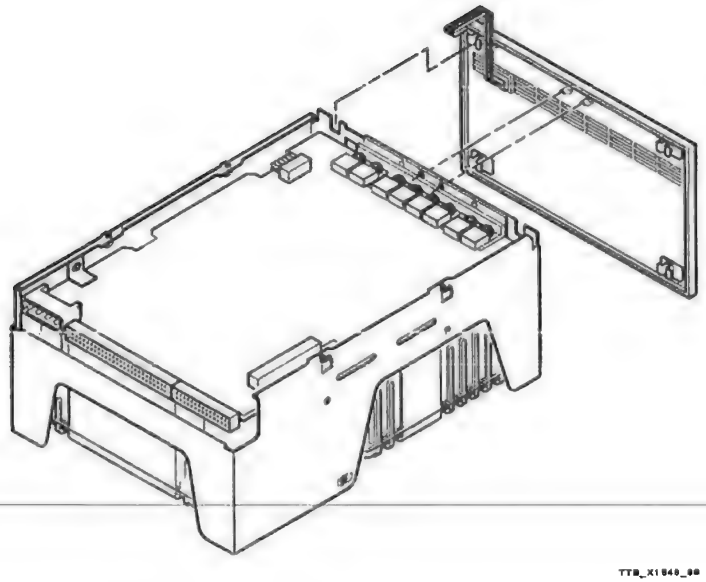


Figure 6–10 RZ55 Bezel Removal

9. If you have already replaced the electronics module on the drive, stop here and replace the whole drive. Otherwise, replace the electronics module as follows.
10. Carefully apply outward pressure to the bezel with your thumbs until the two bezel locking pins clear the holes in the frame. Note that the bezel must flex approximately 1/8 inch to clear the pins.
11. While the bezel is clear of the locking pins, slide it upward until movement stops (about 3/8 inch). Then remove the bezel from the drive.
12. Remove the three screws (Figure 6–11).

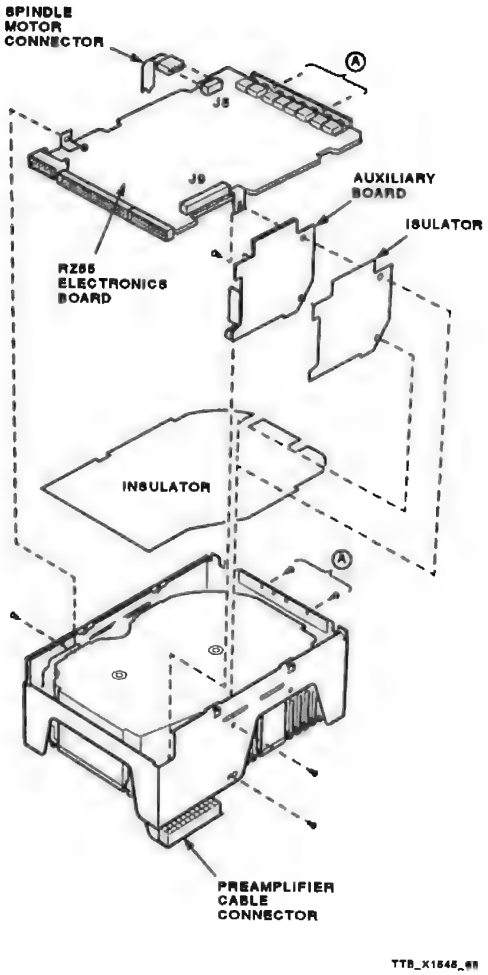


Figure 6–11 Drive Module Removal

13. Unplug the spindle motor connector at J5.
14. Unplug the preamplifier cable connector at the auxiliary board. When setting the drive back on the work surface, place a support under the drive to protect the loose preamplifier cable and connector.
15. Lift the drive module and the auxiliary board up and out of the drive.
16. Remove the screw and speednut holding the drive module.
17. Unplug the auxiliary board from J9 on the drive module.

18. Install the new module by reversing the previous procedure.
19. The jumpers on the new module do not have to be set. Check the new module to be sure the jumpers are set to the same position as on the old module you just removed.
20. Reinstall the RZ55 into the expansion box.

6.1.3.2 RZ55 Expansion Box SCSI ID Switch Board

The SCSI ID switch board is on the inside back wall of the RZ55 expansion box. It contains two switch packs. Only one is on the RZ55 expansion box, and connects to the smaller connector on the RZ55 drive by way of a cable. Follow this procedure to remove the switch board and reverse the procedure to install it.

1. Switch off power to the expansion box.
2. Unscrew the four cover screws and remove the expansion box cover (Figure 6–5).
3. Remove the three screws (Figure 6–6).
4. Lift the shield up, disconnect the power cable, and remove the shield (with the resistor load board) from the expansion box.
5. Disconnect the cable from the SCSI ID switch board (Figure 6–12).

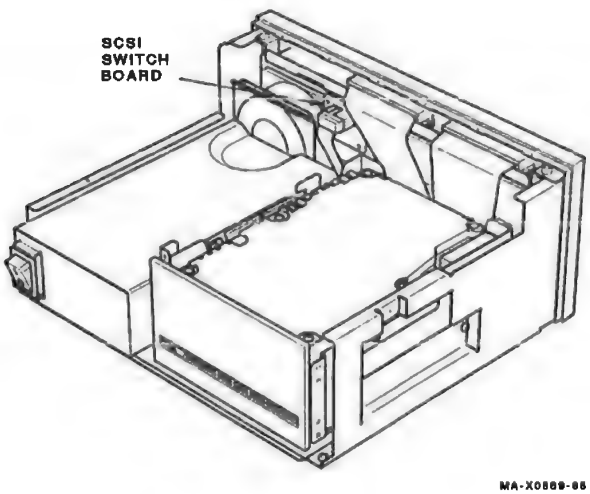


Figure 6–12 RZ55 Expansion Box SCSI ID Switch Board

6. Remove the two screws from the board and remove the board from the expansion box.

7. Set the switch settings on the new SCSI ID switch board to the same position as on the old board you just removed. Figure 6–13 shows the switch settings and the SCSI address ID each setting represents.

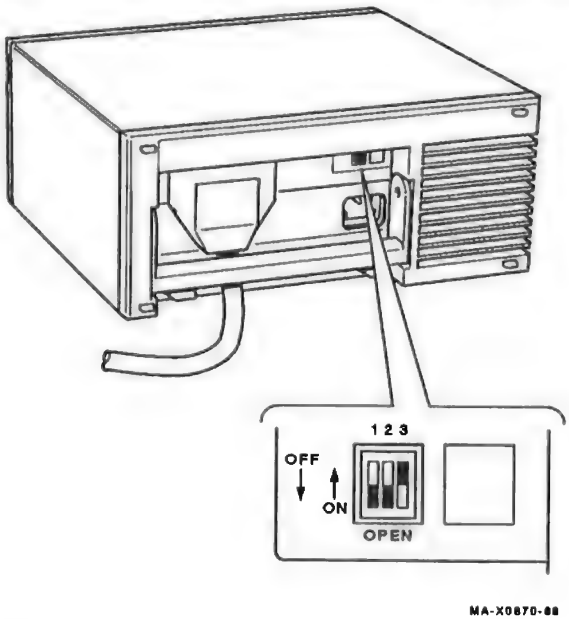


Figure 6–13 RZ55 Expansion Box SCSI ID Switch Setting

6.1.3.3 RZ55 Expansion Box Power Supply Removal

1. Switch off power to the expansion box.
2. Unscrew the four cover screws and remove the expansion box cover (Figure 6–5).
3. Remove the three shield screws (Figure 6–6).
4. Lift the shield up, disconnect the power cable from the resistor load board, and remove the shield (with the resistor load board) from the expansion box.
5. Remove the three drive mounting screws (Figure 6–7).
6. Slide the drive out part way and disconnect the power cable, the SCSI switch cable, and the data cable from the drive.
7. Remove the drive from the box.

8. Tip the RZ55 expansion box on its side, and remove the four power supply screws (Figure 6–14).

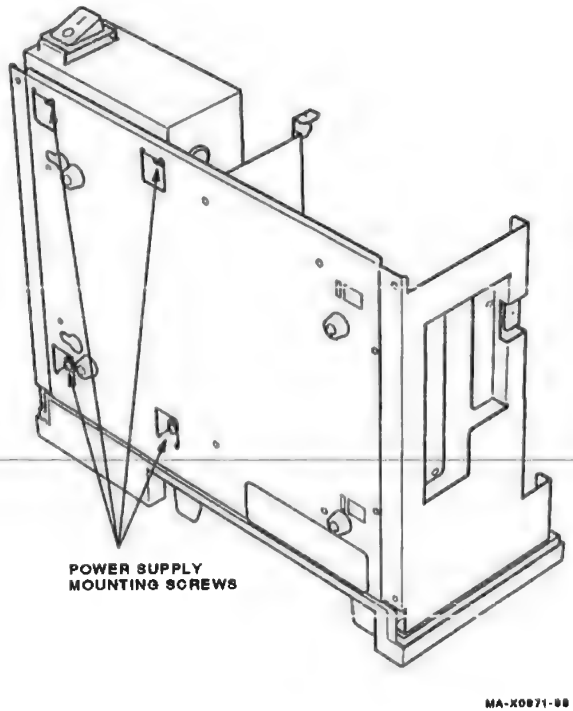


Figure 6–14 RZ55 Expansion Box Power Supply Screws

9. Replace the power supply by reversing the previous procedure.

6.1.3.4 Resistor Load Board Removal

1. Switch off power to the expansion box.
2. Unscrew the four cover screws and remove the expansion box cover (Figure 6–5).
3. Remove the three shield screws (Figure 6–6).
4. Lift the shield up, disconnect the power cable from the resistor load board, and remove the shield (with the resistor load board) from the expansion box.

5. Remove the resistor load board from the standoffs on the shield (Figure 6–15).

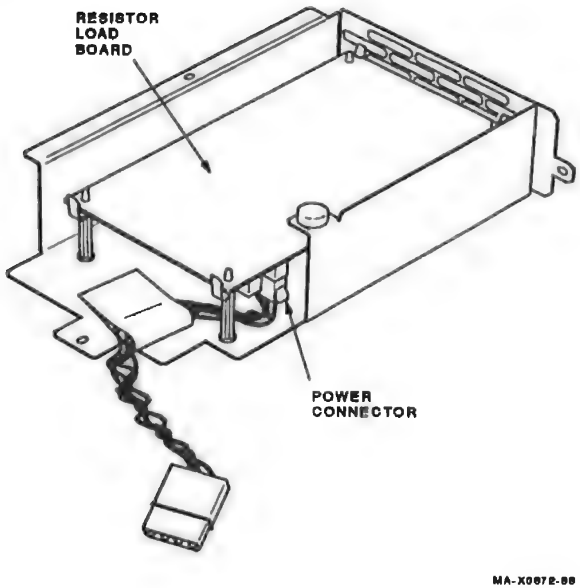


Figure 6–15 RZ55 Expansion Box Resistor Load Board

6. Replace the resistor load board by reversing the previous procedure.

6.2 RRD40 Compact Disc Expansion Box

The RRD40 compact disc expansion box is one FRU. There are no replaceable components inside the box. When you detect an error in the RRD40 compact disc expansion box, replace the whole box as one FRU.

The RRD40 compact disc expansion box connects to the system box through the external SCSI port. The SCSI cable connects to either of the two ports on the back of the expansion box. Install the SCSI terminator on the unused connector, unless another expansion box is daisy chained. If the SCSI port already has a box connected to it, use another cable to connect the RRD40 expansion box to the last box on the daisy chain. Be sure to move the terminator onto the unused connector on the back of the last expansion box in the daisy chain.

One exception is when the TK50Z-FA expansion box connects to the SCSI port (expansion box without a SCSI ID switch on the back of the box, the TK50Z-GA has the switch). The TK50Z-FA expansion box must be disconnected and the RRD40 expansion box must be connected between the external SCSI port and the TK50Z-FA expansion box. The TK50Z0-FA expansion box has termination resistors installed inside its box; therefore, the TK50Z-FA expansion box must be installed at the end of the daisy chain. The TK50Z-GA expansion box does not have the resistors installed and can be anywhere in the daisy chain. The TK50Z-GA expansion box must have the SCSI terminator installed if it is the last box in the daisy chain.

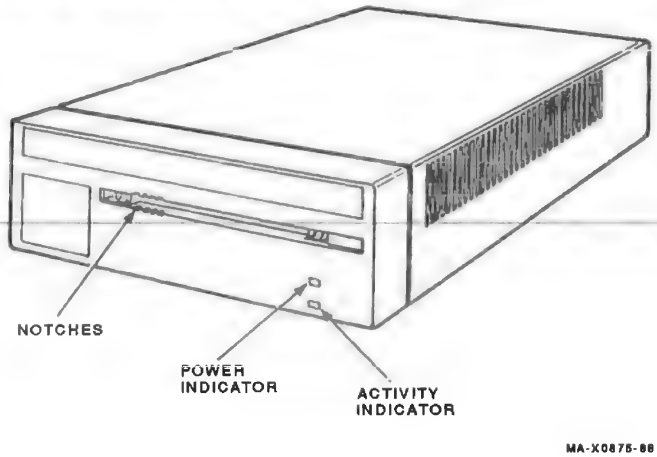


Figure 6–16 RRD40 Compact Disc Expansion Box

6.2.1 RRD40 Compact Disc Expansion Box Troubleshooting

To troubleshoot the RRD40 compact disc expansion box, use the self-test and system exerciser diagnostics in the system box. Refer to Section 2.15.3 if you are not familiar with testing the devices on the SCSI bus.

Self-test results for the RRD40 box should contain 05000001 in the SCSI address ID location set by the switches on the back of the expansion box (should be ID 4). A code of FFFFFF05 for the RRD40 box indicates that the box is not installed, not powered up, not connected to the external SCSI port properly, or faulty. A code of FFFFFFFF indicates that the device was not tested because of a SCSI bus controller error. Any code other than those previously listed indicates an error with the RRD40 compact disc expansion box at that address ID location (should be ID 4), a cabling problem, or an error with the SCSI bus controller on the MSC module. An additional RRD40 expansion box installs at address ID 1 or 0 if no other external boxes connects to these SCSI address IDs on the external SCSI bus.

When running the system exerciser in Field Service mode, the code for the RRD40 compact disc expansion box shows that it is removable, but not writable and that no errors are present (4100.0001 for SCSI ID of 4, 0100.0001 for SCSI ID of 0, and 1100.0001 for SCSI ID of 1). Any error code other than those previously listed indicates an error is most likely on the RRD40 box, but never rule out the possibility of an error on the SCSI bus controller itself.

If the tests indicate an error on the RRD40 compact disc expansion box, perform the following steps:

1. Make sure the expansion box has power and is switched on.
2. Make sure the SCSI cable connects properly to the external SCSI port, or to the previous expansion box, and to the back of the RRD40 expansion box.
3. Make sure the SCSI terminator installs on the unused connector on the back of the box or that the cable secures the next daisy-chained box.
4. Run the tests again.
5. If the problem returns, disconnect the RRD40 expansion box from the daisy chain or from the SCSI port if no other boxes are connected. Install the SCSI terminator on the external SCSI port, and make sure the last expansion box properly terminates. Run self-test (TEST 6).
6. If the status code is not FFFFFF05 for the address ID of the RRD40 expansion box (normally address ID 4), check the SCSI address IDs of all drives on the bus for proper settings. If the address IDs are set correctly, replace the MSC module.
7. If the status code is FFFFFF05, check the address ID switch on the back of the RRD40 expansion box to make sure it is set properly. Refer to Figure 6–17 for proper SCSI ID switch settings.
8. If the address ID is set properly, fault in the RRD40 expansion box or the SCSI cabling exists. Check the cabling for proper connections, terminations, and damaged pins. If the cabling is good, replace the RRD40 expansion box .
9. If a problem still exists, replace the MSC module in the system box.

6.2.2 RRD40 Expansion Box Removal and Replacement

This section describes the removal and replacement procedure for the RRD40 compact disc expansion box. The RRD40 expansion box is a FRU. Remove the RRD40 expansion box by disconnecting the cables and terminator (if installed) on the back of the box. Replace the RRD40 expansion box by reconnecting the cables and terminator (if installed) on the back of the box. Then set the SCSI address ID to the same as on the box you removed. To test the box, switch on the power and run self-test (TEST 6) from the system box.

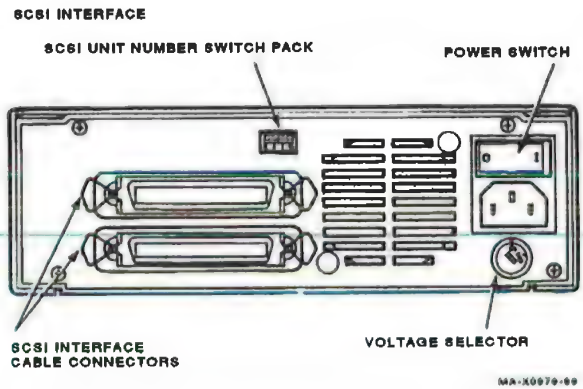


Figure 6–17 RRD40 Expansion Box SCSI Address ID Setting

Address ID on SCSI Bus	RRD40 Expansion Box Switch Settings 1	2	3	4
0	Off	Off	Off	Off
1	Off	Off	On	Off
2	Off	On	Off	Off
3	Off	On	On	Off
4[2]	On	Off	Off	Off
5	On	Off	On	Off
6[1]	On	On	Off	Off
7	On	On	On	Off

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the RRD40 compact disc drive

6.3 TK50Z Expansion Box

Two TK50Z expansion boxes are available: the TK50Z-GA and the TK50Z-FA. The TK50Z-GA expansion box contains external switches for setting the SCSI address and the TK50Z-FA expansion box does not. The TK50Z-FA expansion box must be opened to set the SCSI address using jumpers. You operate and troubleshoot both expansion boxes the same.

The TK50Z-GA expansion box contains five FRUs: the TK50 tape drive, a TZK50 controller board, a power supply, a SCSI ID switch board, and a resistor load board (to regulate the power supply). The TK50Z-FA expansion box contains all of the same FRUs, except for the SCSI ID switch board. Figure 6–18 shows the TK50Z expansion box.

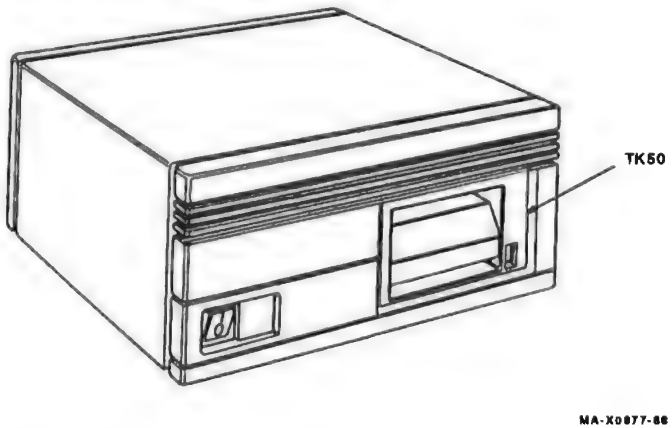


Figure 6–18 TK50Z Expansion Box

The TK50Z expansion box connects to the system box through the external SCSI port. The SCSI cable connects to either of the two ports on the back of the expansion box. The SCSI terminator must be installed on the unused connector unless another expansion box is daisy chained. If the external SCSI port already has a box connected to it, you must use another cable to connect the TK50Z expansion box to the last box on the daisy chain. Be sure to move the terminator onto the unused connector on the back of the last expansion box in the daisy chain. Figure 6–19 shows how the TK50Z expansion box connects to the system box.

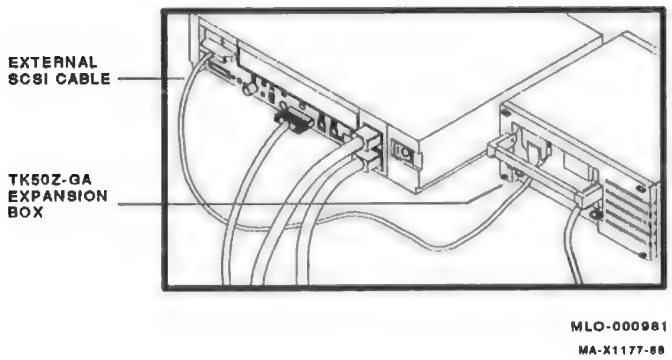


Figure 6–19 TK50Z Expansion Box Connection

One exception is when the TK50Z-FA expansion box connects to the SCSI port (expansion box without a SCSI ID switch on the back of the box, the TK50Z-GA has the switch). The TK50Z-FA expansion box has termination resistors installed inside its box. The TK50Z-FA expansion box must be installed at the end of the daisy chain. The TK50Z-GA expansion box does not have the resistors installed and can be anywhere in the daisy chain. The TK50Z-GA expansion box must have the SCSI terminator installed if it is the last box in the daisy chain.

6.3.1 Troubleshooting the TK50Z Expansion Box

To troubleshoot the TK50Z expansion box, use the self-test and the system exerciser diagnostics in the system box. Refer to Section 2.15.3 if you are not familiar with testing the devices on the SCSI bus.

Self-test results for the TK50Z expansion box should contain 01000001 in the SCSI address ID location of the box (normally address ID 5). The SCSI address ID is set by the switches on the back of the expansion box for the TK50Z-GA version or set by jumpers on the TZK50 controller board inside the box for the TK50Z-FA version. A code of FFFFFF05 for the TK50Z expansion box address ID indicates that it is not installed, not powered up, not connected to the external SCSI port properly, or faulty. A code of FFFFFFFF indicates that the device was not tested because of a SCSI bus controller error. Any code other than those previously listed indicates an error with the TK50Z expansion box at that address ID location, a cabling problem, or an error with the SCSI bus controller on the MSC module.

When running the system exerciser in Field Service mode, the code for the TK50Z expansion box shows that it is removable, but not writable during the first pass (5100.0001 for SCSI ID of 5). During the second and subsequent passes, the code should indicate that it is removable and writable (5300.0001) as long as the special-keyed diagnostic tape is properly loaded. If the special-keyed tape is not loaded, the 5100.0001 code indicates no errors. Any error code other than those previously listed indicates an error is most likely on the TK50Z expansion box, but never rule out the possibility of an error on the SCSI bus controller itself.

If the test results indicate n problem in the TK50Z expansion box, the problem could be the TK50 tape drive, the TZK50 controller board, the power supply, the MSC module in the system box, the SCSI ID switch board, or the SCSI cabling. Perform the following steps to troubleshoot the TK50Z expansion box:

1. Make sure the expansion box has power and is switched on.
2. Make sure the SCSI port cable connects properly to the external SCSI port, or to the previous expansion box, and to the back of the TK50Z expansion box.
3. Make sure the SCSI terminator installs on the unused connector on the back of the box or that the cable secures the next daisy-chained box.
4. Run the tests again.
5. If the problem returns, disconnect the TK50Z expansion box from the daisy chain or from the external SCSI port if no other boxes are connected. Install the SCSI terminator on the external SCSI port, and make sure the last expansion box properly terminates. Run self-test (TEST 6).
6. If the status code is not FFFFFF05 for the address ID of the TK50Z expansion box (normally address ID 5), check the SCSI address IDs of all drives on the SCSI bus for proper settings. If the address IDs are set correctly, replace the MSC module.

7. If the status code is FFFFFF05, check the SCSI address ID switch settings on the back of the TK50Z expansion box to make sure they are set properly. Refer to Figure 6–20 for proper SCSI switch settings. If the TK50Z expansion box does not have the SCSI ID switch on the back of the box (TK50Z-FA), take off the cover of the box and check the jumper settings on the TZK50 controller board (Figure 6–21).
8. If the SCSI address ID is set properly, a fault in the TK50Z expansion box exists. Troubleshoot the TK50Z expansion box using the box's internal self-test described in Section 6.3.1.1.

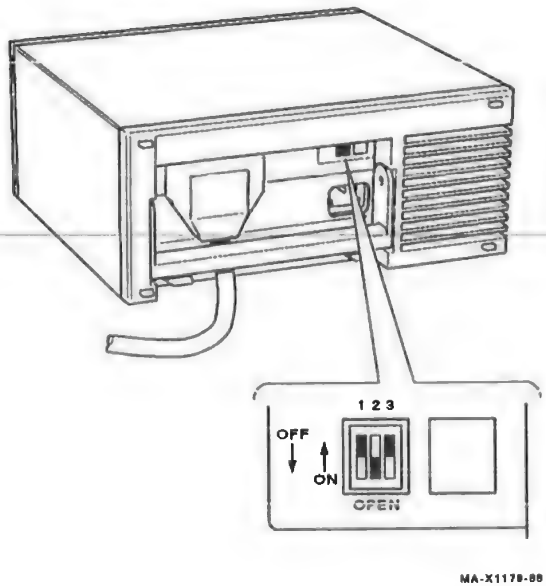


Figure 6–20 TK50Z-GA SCSI Address ID Switch Settings

6.3.1.1 Troubleshooting Inside the TK50Z Expansion Box

The TK50 tape drive and the TZK50 controller board perform an internal self-test every time the tape expansion box is powered up. To do an in-depth self-test on the TK50 tape drive and the TZK50 controller board, perform the following procedure. Do each step indicated until you find and fix the problem. If you need to determine the revision level of the ROMs on the TZK50 controller board or on the tape drive in the expansion box, refer to Section 3.1.6.

1. Remove the TK50Z expansion box cover.

2. Check all cables to make sure they connect properly. Remove the shield to check the cables on the back of the drive. Note that two power cables connect to the resistor load board.

3. If the TK50Z expansion box does not have the SCSI ID switch board installed, check the jumpers on the TZK50 controller board for proper installation. Refer to Figure 6–21 for jumper locations and SCSI port address ID confirmation. Figure 6–21 shows the controller board set for ID address 5, with parity checking enabled, and internal diagnostics disabled. Make sure the three ID address jumpers (P1, P2, and P3) are set to an address ID of 5. Jumper P4 is the parity checking jumper and must be installed for normal operation. Jumper P5 is the diagnostic jumper and must be removed for normal operation. Note the position of the spare jumper(s). Spare jumpers should be stored across P5 and one of the spare posts.

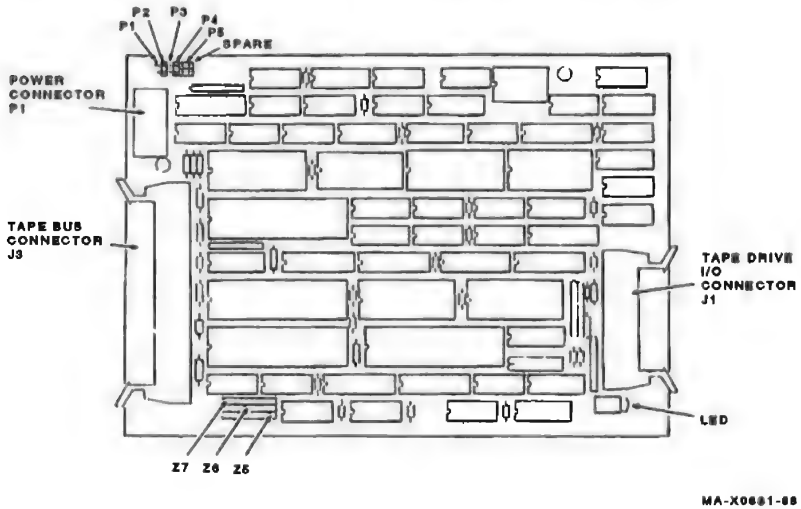


Figure 6–21 TK50Z-FA Expansion Box Controller Board Jumper Settings

Address ID on SCSI Bus	TZK50 Controller Module Switch Settings				
	P1	P2	P3	P4	P5
0	In	In	In	In	Out
1	In	In	Out	In	Out
2	In	Out	In	In	Out
3	In	Out	Out	In	Out
4	Out	In	In	In	Out
5[2]	Out	In	Out	In	Out
6[1]	Out	Out	In	In	Out
7	Out	Out	Out	In	Out

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the TZK50 controller module

4. If the TK50Z expansion box does not have the SCSI ID switch board installed, check the three resistor network packs (Z7, Z6, and Z5) to make sure they are installed properly. The TK50Z expansion box must be the last box connected to the daisy chain on the external SCSI port. Any expansion boxes connected to the daisy chain after the TK50Z expansion box are not accessible unless the resistor network packs are removed.
5. Plug in the power cord and switch on power to the expansion box.
6. If the LED on the TZK50 controller board and on the TK50 tape drive do not light when power is first turned on or the fan does not turn, replace the power supply.
7. Watch the red light on the TK50 tape drive. It should shut off after 5 to 6 seconds after power-up if no tape is installed. If it starts flashing, replace the TK50 tape drive. If a tape is installed, the red light stays on.
8. Look at the LED on the TZK50 controller board. It turns on at power-up for 2 seconds, then turns off. It must stay off once it turns off. If it does not stay off, replace the TZK50 controller board.
9. Insert and load a blank CompacTape cartridge into the tape drive. Do not use a tape cartridge that contains good data, because the next few steps will erase the data.
10. Switch off power to the expansion box.

11. Remove a spare jumper and install it onto P5. If there are two spare jumpers, then both must be removed from their storage positions so one of them can be installed onto P5.
12. Switch on the power switch.
13. Wait about 1 minute for the test to finish. If the LED on the TZK50 controller board starts flashing during or at the end of the test, replace the TK50 tape drive. If the LED is on steady, replace the TZK50 controller board. If the LED is off, the TZK50 controller board and the TK50 tape drive are operating properly. Note that the LED comes on again at the end of the test for about 2 seconds to indicate that the testing cycle completed and is starting over again. The test will continue to cycle until power is switched off and the P5 diagnostic jumper is removed.
14. Replace the faulty FRU component, if any, and retest.
15. Set up the jumpers on the TZK50 controller board for normal operation. Spare jumpers must be stored across P5 and one of the spare posts.

6.3.2 TK50Z Expansion Box FRU Locations

Figure 6–22 shows the locations of the FRUs in the TK50Z expansion box.

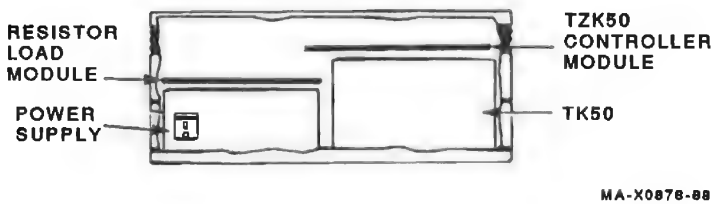


Figure 6–22 TK50Z Expansion Box FRU Locations

6.3.3 TK50Z Expansion Box FRU Removal and Replacement

This section describes the removal and replacement procedures for the FRUs in the TK50Z expansion box. To use this section, find the name of the FRU that needs replacing in Table 6–3, then go to the section listed beside the FRU. Follow the steps in the section to remove the FRU and reverse the procedures to replace the FRU.

CAUTION

Wear a static wrist strap and use a static mat when replacing an FRU.

Table 6–3 TK50Z Expansion Box FRU Section Listings

FRU	Section
Power supply	6.3.3.3
TK50 tape drive	6.3.3.2
TZK50 controller board	6.3.3.1
SCSI ID switch board	6.3.3.4
Resistor load board	6.3.3.5

6.3.3.1 TZK50 Controller Board Removal

1. Switch off power to the expansion box.

2. Unscrew the four cover screws and remove the expansion box cover (Figure 6–23).

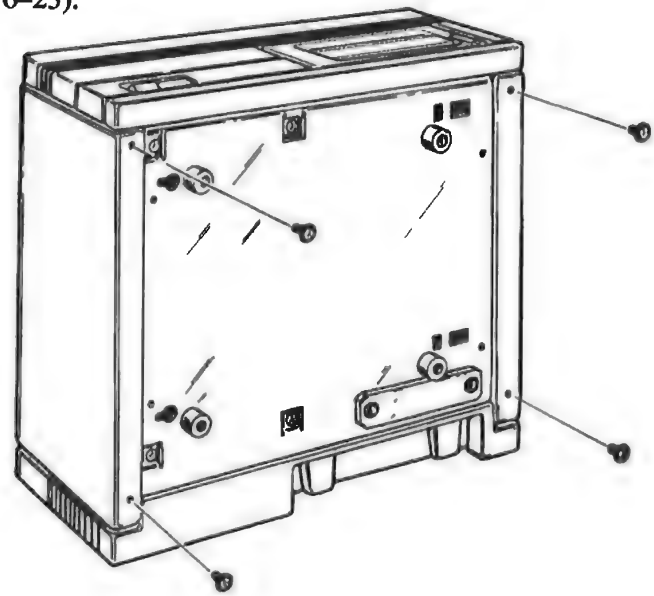


Figure 6–23 TK50Z Expansion Box Cover Screws

3. Disconnect the data cable (J3), the TK50 tape drive I/O cable (J1) and the power cable (P1) from the TZK50 controller board (Figure 6–24).

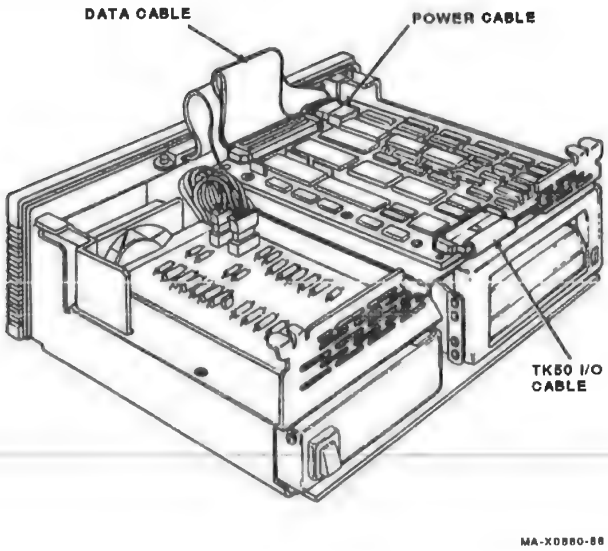


Figure 6–24 TZK50 Controller Board Cables

4. If the TK50Z expansion box contains the SCSI ID switch board, disconnect the switch board cable from the jumper pins on the TZK50 controller board.
5. Remove the TZK50 controller board from the shield.
6. If you are removing the tape drive or the power supply, return to that procedure now. Otherwise, proceed to the next step.
7. If the TK50Z expansion box does not have the SCSI ID switch board installed, set the jumpers on the new TZK50 controller board in the same position as they are on the old TZK50 controller board you just removed (Figure 6–25). If the old board does not have the three resistor packs installed (Z7, Z6, and Z8), remove them from the new board. Figure 6–25 shows the TZK50 controller board configured for ID address 5 with parity checking enabled and internal diagnostics disabled.
8. Replace the TZK50 controller board by reversing the previous procedure.

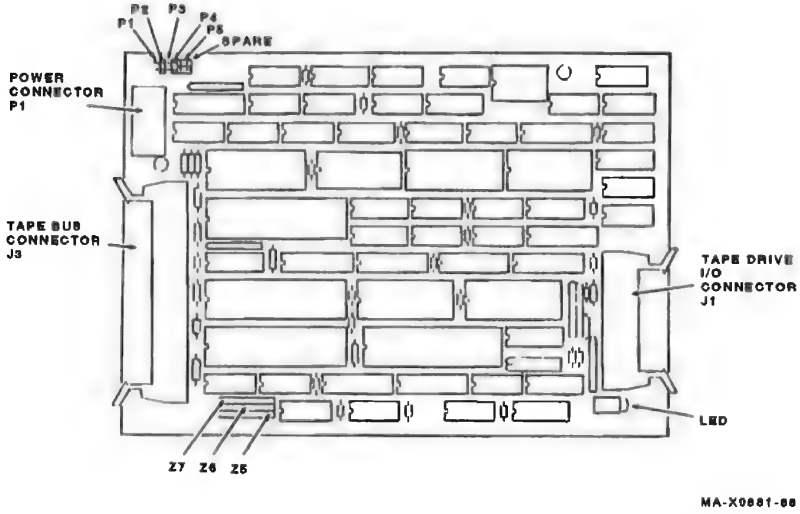


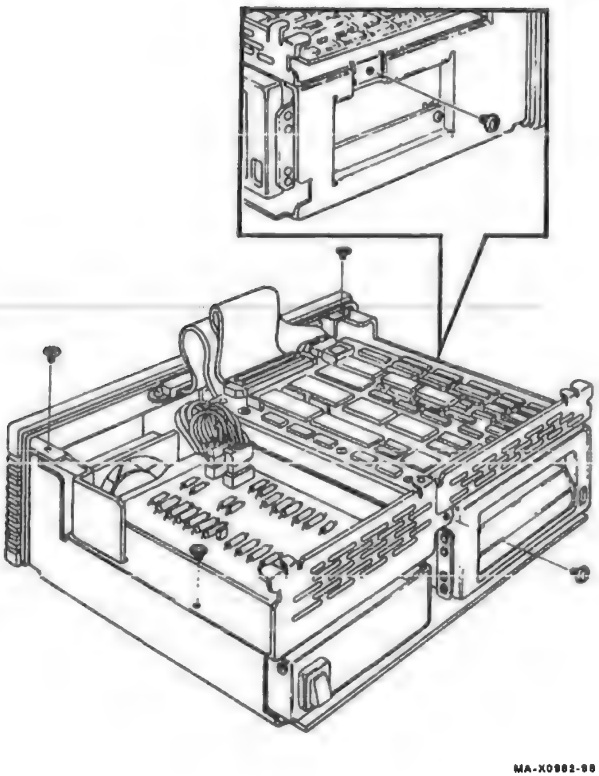
Figure 6–25 TZK50 Controller Board Jumper and Resistor Packs

Address ID on SCSI Bus	TZK50 Controller Module Switch Settings				
	P1	P2	P3	P4	P5
0	In	In	In	In	Out
1	In	In	Out	In	Out
2	In	Out	In	In	Out
3	In	Out	Out	In	Out
4	Out	In	In	In	Out
5[2]	Out	In	Out	In	Out
6[1]	Out	Out	In	In	Out
7	Out	Out	Out	In	Out

[1]Reserved address ID for SCSI bus controller
[2]Recommended address ID for the TZK50 controller module

6.3.3.2 TK50 Tape Drive Removal

1. Remove the TZK50 controller board (Section 6.3.3.1).
2. Disconnect the power cable on the resistor load board that comes from the power supply.
3. Remove the five shield screws (Figure 6–26).



MA-X0982-98

Figure 6–26 TK50Z Expansion Box Shield Screws

4. Disconnect the SCSI cable and the terminator, or both the SCSI cables from the rear of the TK50Z expansion box.
5. Lift the shield up and off of the chassis.

6. Remove the three drive mounting screws (Figure 6–27).

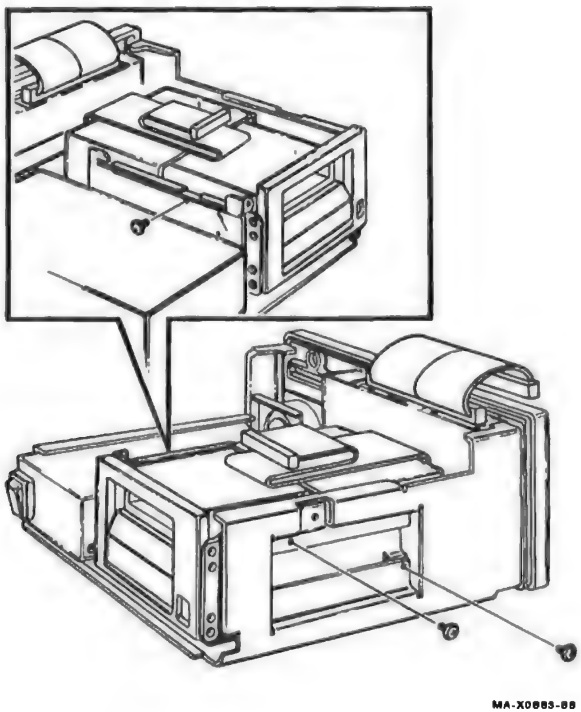
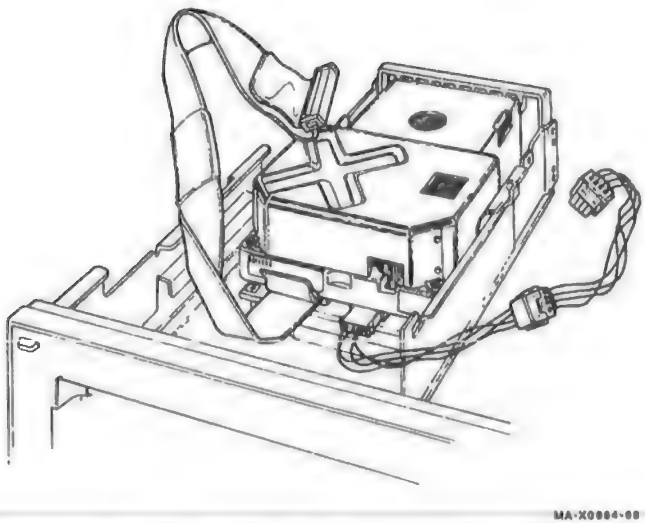


Figure 6–27 TK50Z Expansion Box Drive Mounting Screws

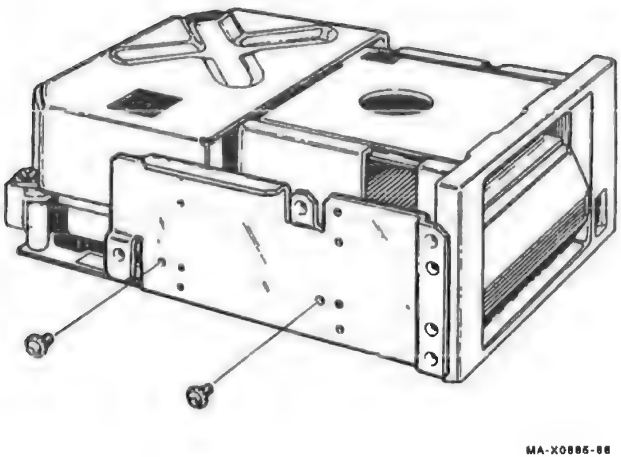
7. Slide the tape drive out halfway and disconnect the I/O cable and the power cable from the back of the drive, then remove the drive (Figure 6–28).



MA-X0884-88

Figure 6–28 Tape Drive Cables

8. Remove the four screws (Figure 6–29). Remove the mounting brackets from the drive.



MA-X0885-88

Figure 6–29 TK50 Mounting Brackets Screws

9. Replace the tape drive by reversing the previous procedure.

6.3.3.3 Power Supply Removal

1. Remove the TZK50 controller board (Section 6.3.3.1).
2. Disconnect the power cable on the resistor load board that comes from the power supply.
3. Unscrew the five shield screws (Figure 6–26).
4. Disconnect the SCSI cable(s) from the back of the expansion box.
5. Lift the shield up and off of the main chassis.
6. Remove the three drive mounting screws (Figure 6–27).
7. Disconnect the power cable from the back of the drive.
8. Slide the drive back into the box, put the expansion box on its side, and remove the four power supply screws (Figure 6–30).

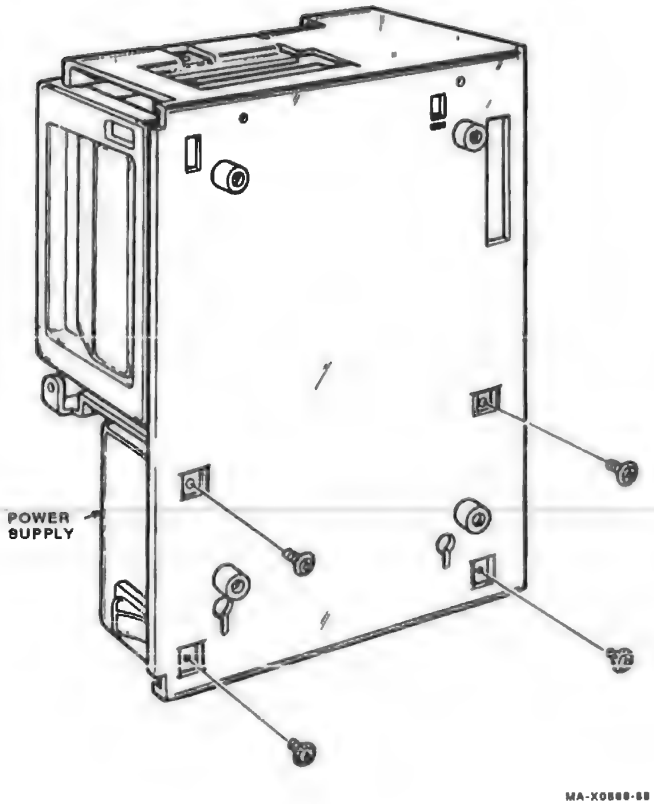


Figure 6–30 TK50Z Expansion Box Power Supply Screws

9. Replace the power supply by reversing the previous procedure.

6.3.3.4 SCSI ID Switch Board Removal

The SCSI ID switch board is on the inside back wall of the TK50Z-GA expansion box. It contains two switch packs. Only one is on the TK50Z-GA expansion box, and connects to the jumper connectors on the TZK50 controller board. Follow this procedure to remove the switch board and reverse the procedure to install it.

1. Switch off power to the expansion box.
2. Unscrew the four cover screws and remove the expansion box cover (Figure 6–23).
3. Disconnect the SCSI ID switch cable from the SCSI ID switch board.

4. Remove the two screws from the board and remove the board from the expansion box.
5. Set the switch settings on the new SCSI ID switch board to the same position as on the old board you just removed. Figure 6–20 shows the switch settings and the SCSI address ID each setting represents.
6. Install the new SCSI ID switch board by reversing the previous procedure.

6.3.3.5 Resistor Load Board Removal

1. Switch off power to the expansion box.
2. Unscrew the four cover screws and remove the expansion box cover (Figure 6–23).
3. Disconnect the two resistor load board power cables (Figure 6–31).

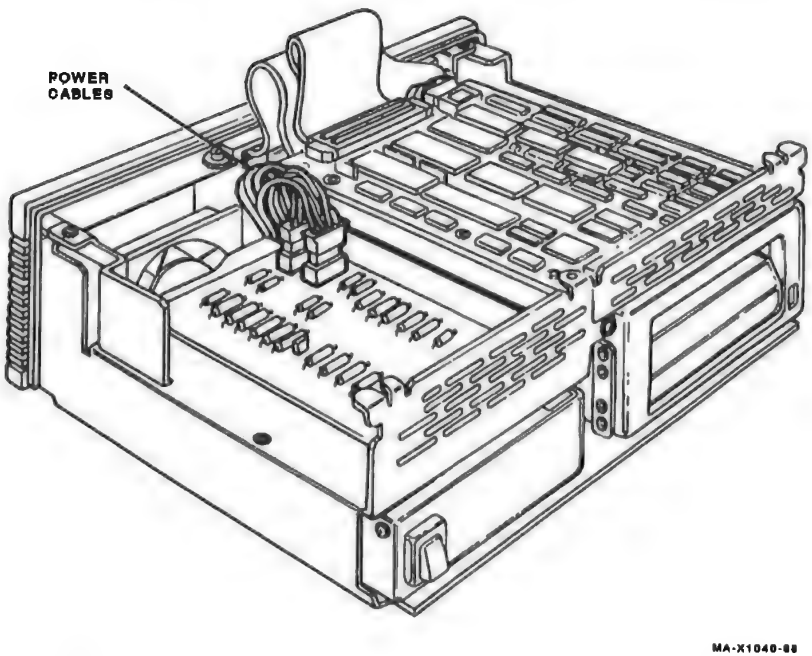


Figure 6–31 TK50Z Expansion Box Resistor Load Board Power Cables

4. Remove the resistor load board from the shield.
5. Replace the resistor load board by reversing the previous procedure.

7
Operating Information

This chapter describes the booting procedures for the VS 3100 system and the operating procedures for the RRD40 compact disc drive, RX23 diskette drive, and the TZ30 tape drive.

7.1 Booting the VS 3100 System

Before you can boot the operating system, you need to determine which device you need to boot. If you already know which device you need to boot from, enter **BOOT device-name** and the system boots that device. If you do not know which device you need to boot from, enter **SHOW DEVICE** to see all of the bootable devices in the system. Figure 7–1 shows an example of the SHOW DEVICE command.

```
>>> SHOW DEVICE
 ESA0       SE0    08-00-2B-02-CF-A4

 DKA300     RZ3    A/3/0/00  DISK     103.5 MB  FX       RZ23
 MKA500     TZ5    A/5/0/00  TAPE     ........  RM
 ...HostID....     A/6       INITR

 DKB100     RZ9    B/1/0/00  DISK     269.3 MB  FX       RZ55
 DKB200     RZ10   B/2/0/00  DISK     106.8 MB  FX       RZ23
 DKB300     RZ11   B/3/0/00  DISK     45.2 MB   FX       RZ22
 DKB400     RZ12   B/4/0/00  RODISK   xxxxxxxx  RM  WP   RRD40
 ...HostID....     B/6       INITR

>>>
```

Figure 7–1 Example of the SHOW DEVICE Command

In the previous example, ESA0 is the Ethernet device and displays the Ethernet address of the system. The SCSI buses are listed next. Only one SCSI bus (SCSI-A) is listed on the model 30 systems that contain an ST506/SCSI MSC module. DKA300 is the RZ23 at address ID 3 on the SCSI-A bus and displays that it is a fixed disk (FX). MKA500 is the TZ30 at address ID 5 on the SCSI-A bus and displays that it is a tape drive which is removable (RM). HostID is the address ID of the SCSI-A controller (ID 6). DKB100 is the RZ55 expansion box at address ID 1 on the SCSI-B bus and is a fixed disk (FX). DKB200 and DKB300 are the RZ23 and RZ22 at address ID 2 and 3 on the

SCSI-B bus and are both fixed disks. DKB400 is the RRD40 compact disc at address ID 4 on the SCSI-B bus and displays that it is a read-only disk (RODISK), removable media (RM), and is write-protected (WP). The second HostID is the address ID of the SCSI-B controller (ID 6).

The VS 3100 systems include the following devices:

- DKAx00[1] — RZ22, RZ23, or RZ55 on SCSI-A bus
- DKBx00[1] — RZ22, RZ23, or RZ55 on SCSI-B bus
- DUA2 — RX23 in system box on model 30 systems only
- ESA0 — Ethernet booting device.
- MKAx00[1] — Tape drive on SCSI-A bus
- MKBx00[1] — Tape drive on SCSI-B bus

If no device name is specified when entering the BOOT command, the system checks NVR for a default device and boots off that device. If no device is stored in NVR, the system automatically assigns ESA0 as the boot device and sends out a boot inquiry over the Ethernet once every 30 seconds for 5 minutes. If no host responds within the first 5 minutes, the system waits for 5 minutes. The system then starts sending a boot inquiry again every 30 seconds for 5 more minutes. This pattern is repeated until a host boots the node or until you press the halt button.

7.2 The RRD40 Compact Disc Drive

The RRD40 is available as a tabletop version (expanion box) or a half-height version in the model 40's system box. Figure 7–2 and Figure 7–3 show the two RRD40 drives. Operating the drive is the same regardless of the location of the RRD40 drive.

[1] The x indicates the SCSI address ID of the drive (0 to 7)

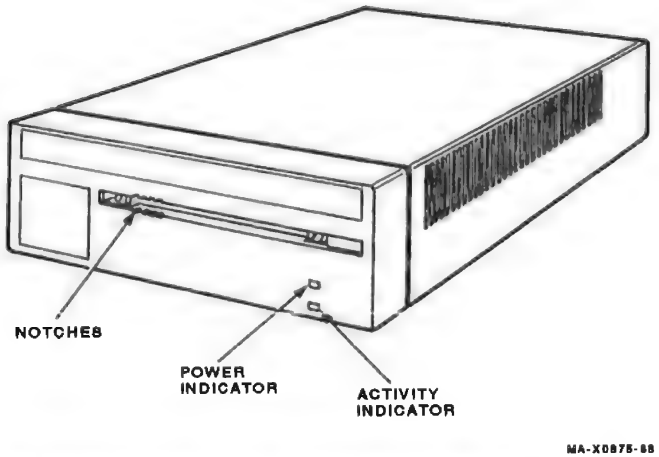


Figure 7–2 RRD40 Compact Disc Expansion Box

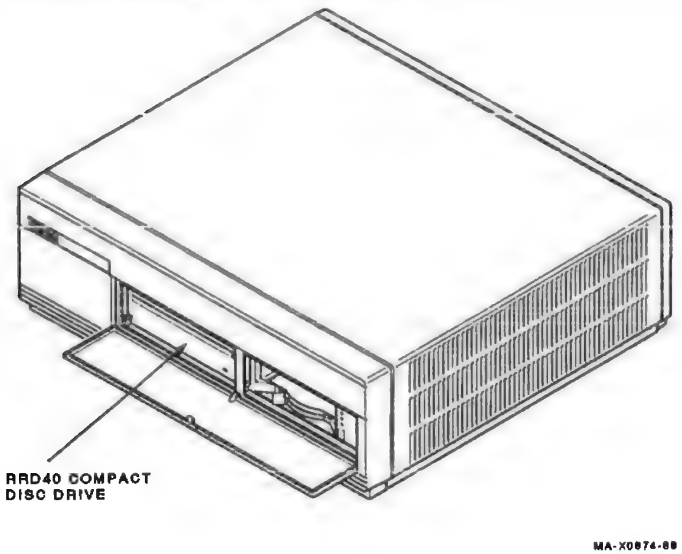


Figure 7–3 RRD40 Compact Disc in the Model 40 System

7.2.1 Front Panel

To avoid confusion, the front panel on the RRD40 expansion box and the RRD40 drive installed in the system box are described separately in the following sections.

7.2.1.1 RRD40 Expansion box

The front panel consists of a disc access door, an activity indicator, and a power indicator (Figure 7–2). The activity indicator lights when a disc is properly loaded into the RRD40 drive. The indicator flashes when the disc is transferring data. The power indicator lights when power is on.

7.2.1.2 RRD40 Drive in the Model 40 System

The front panel consists of a disc access door and one activity indicator. The activity indicator lights when a disc is properly loaded into the RRD40 drive. The indicator flashes when the disc is transferring data.

7.2.2 Loading a Disc

When loading a disc, the entire disc caddy is inserted into the disc access door on the drive. **Do not** remove the disc from the caddy. Proceed as follows:

1. Make sure the power is on.
2. Examine the disc caddy. Make sure that it is not cracked or damaged in any way. Never load a damaged caddy into an RRD40 drive.
3. Examine the disc inside the caddy. Note that one side is labeled. The label should always be facing up as you insert the disc into the drive. When the label is facing up, the four notches on the disc housing are on the left (Figure 7–4). These notches line up with the four similar notches on the front of the RRD40 drive.

   NOTE

   If you have the disc positioned label side up and the notches are on the right, then the disc is oriented improperly in the caddy. Proceed no further with the disc loading. Go to Section 7.2.4 and repair the disc and the caddy.

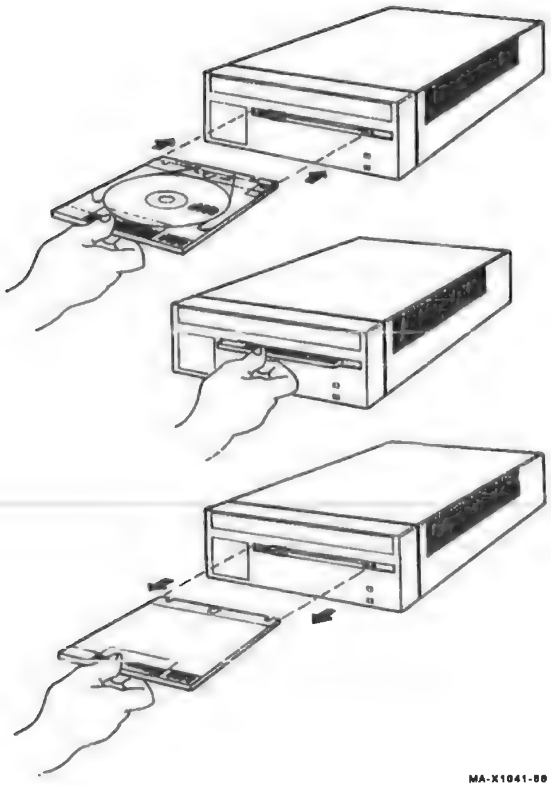


Figure 7–4 RRD40 Compact Disc Loading

4. Insert the disc caddy (Figure 7–4). Line up the notches on the caddy with the notches on the disc access door. Slide the caddy in as far as it will go and then remove it. When removed, notice that the disc and its housing remain in the drive. Only the transparent sleeve comes out.

5. Check that the front panel activity indicator lights within 5 seconds. If the drive accepted the disc and the activity indicator does not light, then the disc may have been orientated in the caddy incorrectly. Unload the disc using the instructions in the following section. Refer back to step 3 and examine the disc orientation in the caddy. If the disc is orientated properly, the RRD40 drive may be faulty.

7.2.3 Unloading a Disc

Before unloading a disc, make sure that the activity indicator is not flashing. If it is flashing, then the RRD40 is transferring data. Wait intil the indicator stops flashing.

1. Orient the transparent sleeve for loading. Make sure the arrow is going into the drive first. Use Figure 7–4 as a guide (the unloading procedure is the same as the loading procedure).
2. Insert the sleeve into the access door as far as it will go.
3. Remove the caddy. The disc and housing will be back in the sleeve. The activity indicator will go out.

7.2.4 Disc and Caddy Repairing

The RRD40 media is contained inside a protective caddy. The caddy consists of three parts: the disc, the disc housing, and the transparent sleeve (Figure 7–5).

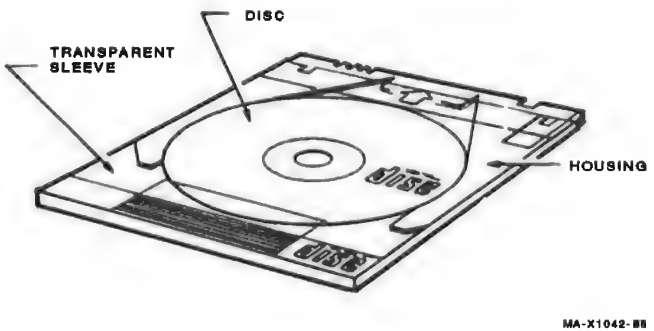


Figure 7–5 Disc Parts

If the transparent sleeve is damaged or cracked or if the disc needs cleaning, the caddy can be taken apart.

It is very important that the disc is mounted in the caddy properly. Failure to mount the disc properly makes the disc inaccessible by the SCSI bus controller.

7.2.5 Removing the Disc from the Caddy

To remove the disc from the caddy for cleaning or caddy repairing, proceed as follows:

1. Hold the caddy so that it is facing label side down. Locate the locking tabs on either side of the disc housing (Figure 7–6).

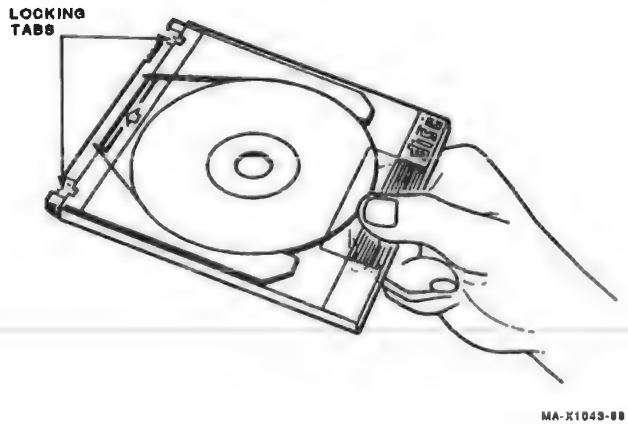


Figure 7–6 Disc Tabs

2. For each locking tab, press down on the tab while slilghtly separating the housing from the sleeve. Use your fingernail or a sharp, pointed instrument.

3. When both tabs have been disengaged, pull the disc housing out to about the midpoint of the disc (Figure 7–7).

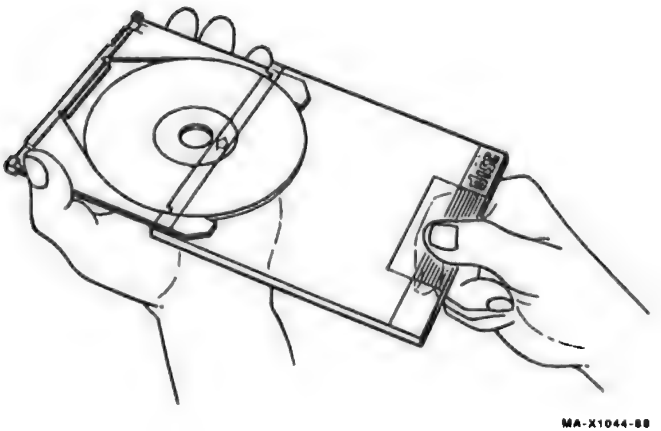


Figure 7–7 Separating the Caddy

4. Hold the disc housing on each side (Figure 7–7). Exert inward pressure on the housing so the disc does not fall out. Remove the sleeve from the housing. Place the sleeve aside.

5. Grasp the disc with your free hand (Figure 7–8). Position your thumb on the outer edge of the disc and your index finger in the center hole of the disc. Release pressure from the housing and remove the disc.

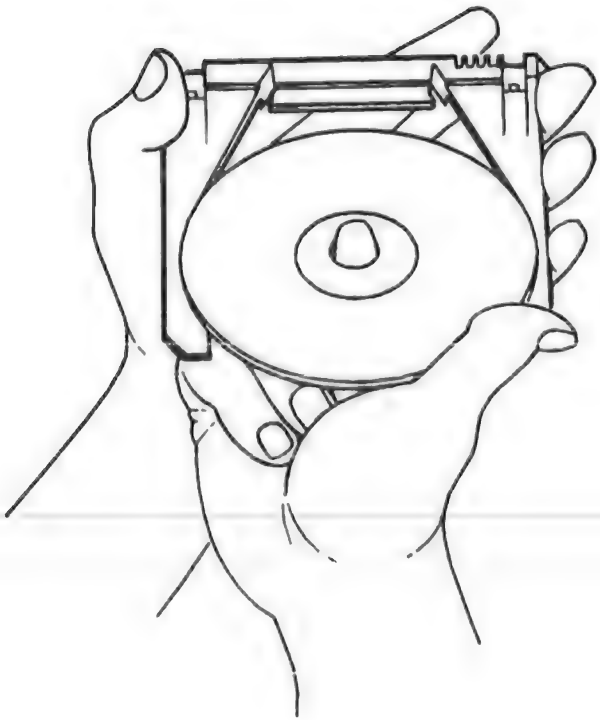


Figure 7–8 Removing the Disc

7.2.6 Cleaning a Disc

The disc can be cleaned with a dry, lint-free cloth. The disc should always be free of dust, dirt, and fingerprints. Always hold a disc by the edges. Never touch the data area of the disc.

To clean, wipe from the center of the disc to the edges. Use small circular strokes. Do not use a continuous circular stroke around the disc.

7.2.7 Replacing the Disc in the Caddy

Assembling the caddy is essentially a reverse of the removal procedures. Make sure that your hands are positioned as shown in the illustrations. It is very important that the disc is replaced properly.

1. Position the housing and disc (Figure 7–8). Always work with the disc so the label is facing down.
2. Insert the disc into the housing. The inside of the housing is grooved to accept the disc. Exert inward pressure to hold the disc in the housing.
3. Slide the housing into the transparent sleeve all the way until it clicks into place.
4. Turn the assembly over so that the label on the disc is facing up. Make sure that the notches on the housing are on the left. If the notches are not on the left when the disc is label side up, then the disc is mounted incorrectly inside the caddy. Remove the disc from the caddy and reorient the disc.

7.3 The RX23 Diskette Drive

The RX23 is a half-height, high density, 3.5 inch, double-sided, diskette drive. It has a formatted capacity of 1.47 Mbytes. The RX23 can read and write industry-compatible 3.5 inch, high density, diskette media. The RX23 ia compatible with field-formatted industry standard, 18 sector format on 700 oersted type media.

The RX23 is a single FRU. If a failure is detected in the RX23, the entire drive is replaced.

The media for the RX23 diskette drive is a 3.5 inch diskette. This diskette can be either 1 or 2 Mbytes. A notch on the diskette determines the byte capacity of the diskette. A microswitch in the front of the drive detects which size diskette is loaded.

7.3.1 Loading and Unloading the Drive

To load the RX23, first make sure that the front LED is not lit. Then insert diskette (Figure 7–9). The diskette slides straight in and drops down to its load position.

To unload the RX23, first make sure that the front LED is not lit. Then press the eject button on the lower right side of the drive. The diskette unloads and emerges from the drive.

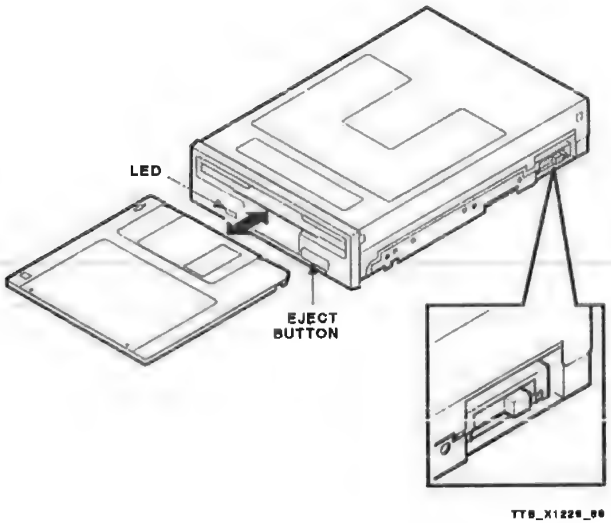


Figure 7–9 RX23 Loading and Unloading

7.3.2 RX23 LEDs and Buttons

The RX23 floppy drive has one LED on the front of the drive that indicates when the drive is operating. Do not attempt to load or unload a diskette when this LED is lit. The diskette eject button is also on the front of the drive.

7.4 The TZ30 Tape Drive

This section describes the controls and indicators as well as the operation of the TZ30 tape drive. The TZ30 tape drive is installed in the system box.

7.4.1 Controls and Indicators

The front of the TZ30 tape drive has three LEDs, an unload button, and a cartridge insert/release lever (Figure 7–10). The TZ30 also has a beeper that sounds when the cartridge insert/release lever is ready for operation. Section 7.4.2 explains how to insert, use, and remove the tape cartridges.

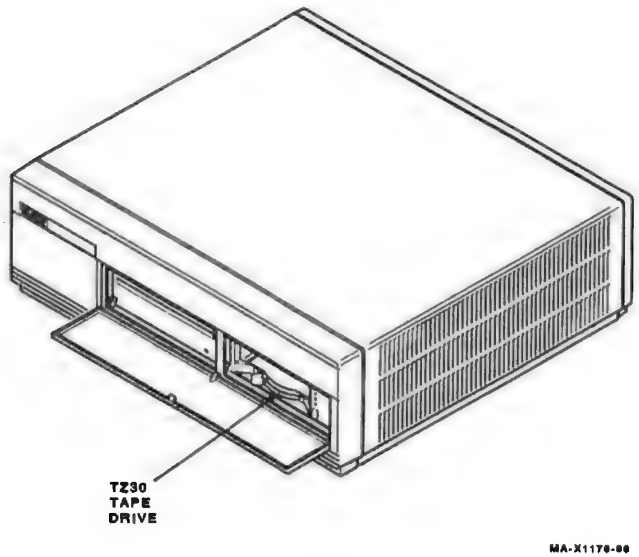


Figure 7–10 TZ30 Tape Drive in the VS 3100 System

Table 7–1 TZ30 Controls and Indicators

LEDs		
LED	**State**	**Meaning**
Green	On (steady)	Okay to operate the cartridge insert/release lever.
	Off	Do not operate the cartridge insert/release lever.
	Blinking	The drive detects a cartridge error. Okay to operate the cartridge insert/release lever.
Yellow	On (steady)	The tape is ready for use.
	Regular blinking	The tape is in use; the tape is loading or unloading.
	Irregular blinking	The tape is in use; a read or write operation is in progress.
Orange	On	The tape is write-protected.
	Off	The tape is write-enabled.
All three LEDs	On (steady)	The power-up self-tests are running
	Blinking	The drive has detected a hard error.

Other Controls and Indicators		
Control/Indicator	**Description**	**Function**
Unload button	Momentary switch	Rewinds the tape and unloads it from the drive into the cartridge.
Beeper	Momentary alarm	Sounds when the cartridge insert/release lever is ready to operate.
Cartridge insert/release lever	Mechanical lever	Locks the tape cartridge into place. Sliding the lever to the left (or open) position enables you to insert the cartridge; sliding the lever to the right (or closed) position enables you to lock in the cartridge.

Table 7–1 (Cont.) TZ30 Controls and Indicators

Other Controls and Indicators		
Control/Indicator	**Description**	**Function**
		To remove the cartridge, first be sure the tape is rewound and unloaded, then slide the lever to the open position. You can slide the lever only when the green LED is on and the beeper has sounded.

7.4.2 TZ30 Operation

Before inserting a new cartridge in the tape drive, open the cartridge door and inspect the position of the leader (Figure 7–11).

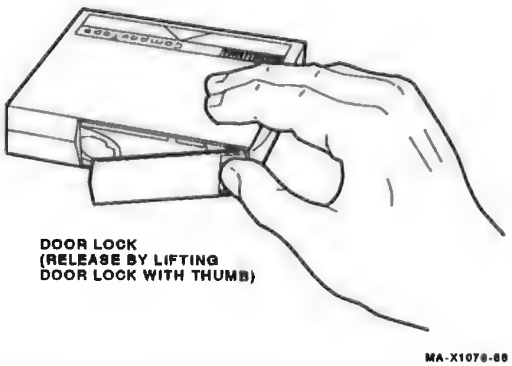


Figure 7–11 TZ30 Tape Cartridge Door

Before using the TZ30 for the first time, check the position of the take-up leader in the TZ30. Figure 7–12 shows some potential misalignments and how to fix them. Use a small nonmetallic instrument to realign the take-up leader if necessary.

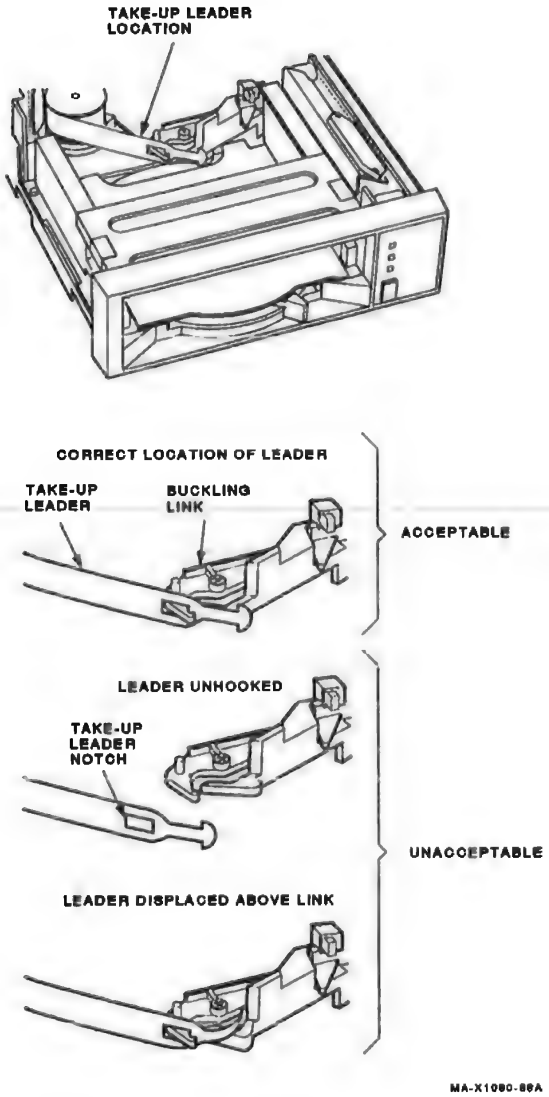


Figure 7–12 TZ30 Take-Up Leader Adjustment

7.4.2.1 Inserting a Tape Cartridge

The following steps describe how to insert a tape cartridge in the drive, as well as the state of the TZ30 LEDs when the VS 3100 system is powered up. See Figure 7–13.

1. The green, yellow and orange LEDs light steadily for about 2 seconds while running self-tests.
2. The green and orange LEDs go out and the yellow LED blinks, indicating that the self-test is still running.
3. The green LED lights (and the beeper sounds) indicating that self-tests completed successfully and the cartridge insert/release lever is ready for operation.

   When the green LED is on steadily, slide the lever to the open position and insert the cartridge. (If an error occurs when you insert the cartridge the green LED blinks and the tape does not move. Try another cartridge.) Return the lever to the closed position.
4. The green LED goes off and the yellow LED blinks regularly to indicate that the tape is loading.
5. When the tape is positioned at the beginning-of-tape (BOT) marker in the drive, the yellow LED lights steadily. The tape is now ready for use.

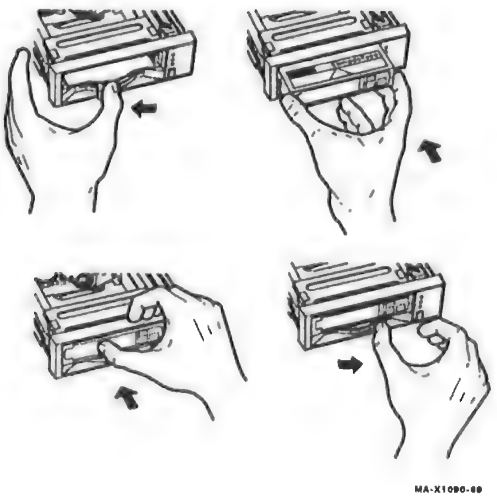


Figure 7–13 Inserting a TZ30 Tape Cartridge

When a new tape cartridge is inserted, the TZ30 performs its calibration routine as it executes the first command. This calibration may take up to 30 seconds of winding and rewinding the tape.

While the tape is in use, the yellow LED blinks irregularly.

If you use a tape cartridge written on a TK70 tape drive, the orange LED lights to indicate that the tape is write-protected. The orange LED also lights if the write-protect switch on a CompacTape or CompacTape II cartridge is in the write-protect position.

NOTE

The orange LED turns off if you set the write-protect switch to the write-enable position while the cartridge is in the drive. However, VMS still gives a message that the tape is write-protected. Dismount the tape and mount it again by giving the DISMOUNT and MOUNT commands.

7.4.2.2 Removing a Tape Cartridge

The following sequence describes how to remove a tape cartridge from the drive, as well as the sequence followed by the LEDs. (Figure 7–14).

1. Press the unload button to rewind and unload the tape into the cartridge.

   NOTE

   If you use the DISMOUNT command from the console, you do not need to press the unload button. If you use the /Nounload qualifier with the DISMOUNT command, you must press the unload button. If you do not use the /Nounload qualifier with the DISMOUNT command, you will receive a *device not software enabled* message from the operating system since the tape will unload. If this occurs, you will have to physically remove the cartridge and reload the tape drive to recover.

   The yellow LED blinks regularly during the unloading process.

   The green LED lights and the beeper sounds.

2. Slide the cartridge insert/release lever to the open position and remove the cartridge.

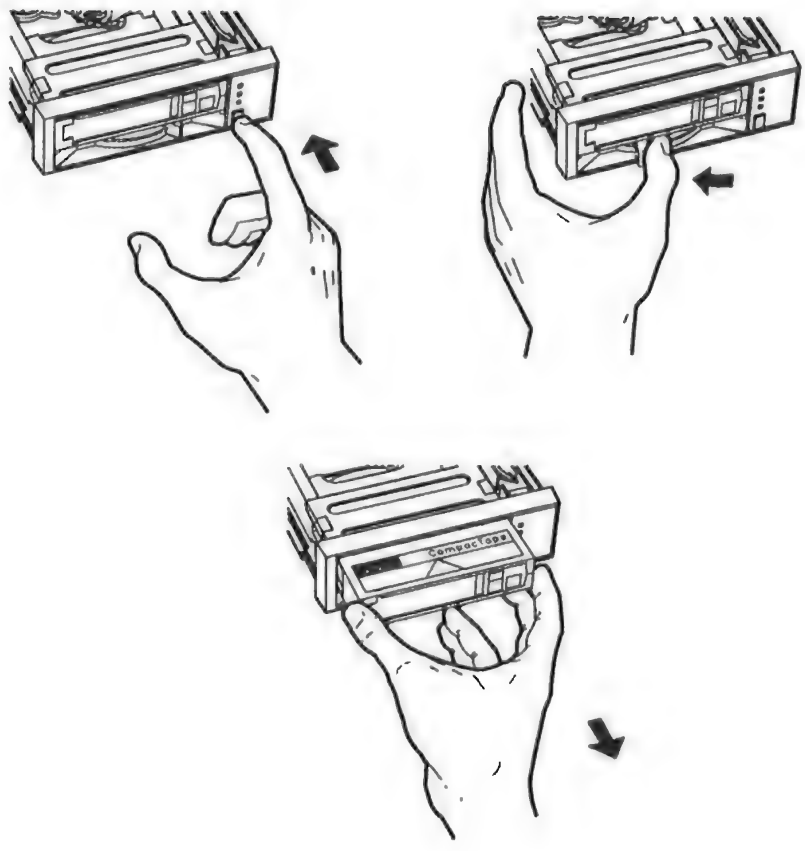


Figure 7–14 Removing a TZ30 Tape Cartridge

A
Console Test Commands

This appendix lists all of the test commands including the utilities. Test numbers for Field Service diagnostics and certain noncustomer utilities are rejected if the loopback connector is not installed on the communication port.

Table A–1 Test Commands

Test	Loopback
Diagnostic Commands — Explained in Chapter 1	
T F	Self-test on base video (MONO)
T E	Self-test on time-of-year clock (CLK)
T D	Self-test on nonvolatile RAM (NVR)
T C	Self-test on serial line controller (DZ)
T B	Self-test on system memory (MEM)
T A	Self-test on memory management unit (MM)
T 9	Self-test on floating point unit (FP)
T 8	Self-test on interval timer (IT)
T 7	Model 30, self-test on RX23 diskette (STRG-1)
T 7	Model 30/40, self-test on the SCSI-A bus
T 6	Model 30, self-test on the SCSI-A bus
T 6	Model 30/40, self-test on the SCSI-B bus
T 5	Self-test on interrupt controller and Ethernet ID ROM (SYS)
T 4	Self-test for 8-plane option
T 3	Self-test for future option—no test run

Table A–1 (Cont.) Test Commands

Test		Loopback
T 2	Self-test for future option—no test run	
T 1	Self-test on the Ethernet circuits (NI)	
T 0	Customer mode system exerciser	
T 101	Field Service mode system exerciser (two pass).	X
T 102	Field Service mode system exerciser (continuous).	X
T 80000106	Selects individual devices for exerciser tests	X
	Utility Commands — Explained in Chapter 3	
T 50	Configuration display	
T 51	Set NVR default boot device	
T 52	Set NVR default boot flags	
T 53	Set NVR default recovery action flags	
T 54	Display language inquiry menu	
T 55	Display extended summary for Field Service system exerciser	
T 60	Circle-crosshatch alignment pattern without graphics option installed	X
T 61	Screen of E's without graphics option installed	
T 62	White screen without graphics option installed	
T 70	Mass storage diskette formatter	
T 72	Special key on diskettes	X
T 73	Special key on CompacTapes	X
T 75	SCSI disk data eraser	
T 80	Circle-crosshatch with graphics option installed	X
T 81	Screen of all E's with graphics option installed	
T 82	White screen with graphics option installed	
T 83	4-bar color bars with graphics option installed	X
T 84	Red screen with graphics option installed	X

Table A–1 (Cont.) Test Commands

Test		Loopback
T 85	Green screen with graphics option installed	X
T 86	Blue screen with graphics option installed	X
T 87	8-bar color bars with graphics option installed	
T 88	Gray scale display with graphics option installed	

B
Console Commands

B.1 Console Command Syntax

- The console program accepts commands up to 80 characters long. Longer commands result in an error message. The character count does not include rubouts, rubbed-out characters, or the terminating Return.
- Type-ahead is not supported. Characters received before the console prompt >>> appears on the screen are discarded. Only the following control sequences received before the console prompt >>> appears on the screen are recognized: Ctrl S, Ctrl Q, and Ctrl C.
- Commands can be abbreviated by typing the first character in the command name. All commands are recognized by their first character. For example, B stands for the BOOT command and T stands for the TEST command.
- The console program treats multiple adjacent spaces and tabs as a single space. Leading and trailing spaces and tabs are ignored.
- Command qualifiers can appear after the command keyword or after any symbol or number in the command.
- All numbers (addresses, data, and counts) are hexadecimal except for symbolic register names which are decimal.
- The console program accepts uppercase and lowercase letters.

B.2 Console Commands

The following sections describe the console commands:

B.2.1 BOOT

>>> BOOT [<qualifier>][<device_name>]

The boot program is called virtual machine boot (VMB). The console program intializes and starts VMB running.

Qualifier

/R5:<data> - After initializing the processor and before starting VMB, R5 is loaded with the specified data (in hexadecimal). This allows a console user to pass a parameter to VMB.

Device_name

VMB boots the operating system from the device specified in the <device_name>. The device_name is in the form LLLD, where the first three characters are uppercase letters and the fourth character is a digit (0 through 9). A terminating colon in the device_name is acceptable, but is not required. Devices for the VS 3100 systems are listed as follows:

- DKAx00 — RZ23, RZ24, or RZ55 on SCSI-A bus at address ID x (0 to 7)
- MKAx00 — Tape drive on SCSI-A bus at address ID x (0 to 7)
- DUA2 — RX23 in system box on model 30 systems only
- ESA0 — Ethernet booting device.
- DKBx00 — RZ23, RZ24, or RZ55 on SCSI-B bus at address ID x (0 to 7)
- MKBx00 — Tape drive on SCSI-B bus at address ID x (0 to 7)

Enter the **SHOW DEVICE** command to see the list of devices installed in the system.

If no device_name is specified, the console program automatically assigns ESA0 as the boot device and sends out a boot inquiry over the Ethernet once every 30 seconds for 5 minutes. If no host responds within the first 5 minutes, the console program waits for 5 minutes without sending out a boot inquiry. The console program then starts sending a boot inquiry again every 30 seconds for 5 more minutes. This pattern is repeated until a host boots the node or until you press the halt button.

B.2.2 COMMENT

>>> ! <comment>

The COMMENT command (the exclamation point) is ignored by the console program. It is used to annotate console I/O command sequences.

B.2.3 CONTINUE

>>> CONTINUE

The processor begins instruction execution at the address currently contained in the program counter. The address in the program counter is the address that was saved when the console program was started or is the address that was entered by the operator using the DEPOSIT command. Processor initialization is not performed. The console program enters program I/O mode (operating system such as VMS or Ultrix).

B.2.4 DEPOSIT

>>> DEPOSIT [<qualifier>] <address><data>

Deposits the data into the specified address. If no address space or data size qualifiers are specified, the defaults are the address space and data size used in the last DEPOSIT or EXAMINE command. After processor initialization, the default address space is physical memory, the default address is zero, and the default data size is longword.

Qualifiers

- /B — The data size is byte.
- /W — The data size is word.
- /L — The data size is longword.
- /V — The address space is virtual memory. If memory mapping is not enabled, virtual addresses are equal to physical addresses.
- /P — The address space is physical memory.
- /I — The address space is internal processor registers.
- /G — The address space is the general registers (R0 through R15).
- /M — The address space is the machine register.
- /U — Enables access to console program memory.

- /N:<count> — The address is the first address in a range of addresses specified in count. The console program deposits to the first address and then to the specified number of succeeding addresses. Even if the address is the symbolic address "-", the succeeding addresses are at the larger addresses. The symbolic address specifies only the starting address, not the direction of succession. For repeated references to preceding addresses, use "Repeat Deposit - <data>".

Address

- Processor status longword (PSL) — The address space is set to /M automatically. Do not specify any address space qualifiers with PSL.
- Program counter (PC) (general register R15) — The address space is set to /G automatically.
- Stack pointer (SP) (general register R14) — The address space is set to /G automatically.
- General register (RN) — The register number is in decimal. The address space is /G.
- + (plus) — The location immediately following the last location referenced in a DEPOSIT or EXAMINE command. For references to physical or virtual memory spaces, the location referenced is the last address **plus** the size of the last reference (1 for byte, 2 for word, 4 for longword). For other address spaces, the address is the last address referenced **plus** one.
- - (minus) — The location immediately preceding the last location referenced in a DEPOSIT or EXAMINE command. For references to physical or virtual memory spaces, the location referenced is the last address **minus** the size of this reference (1 for byte, 2 for word, 4 for longword). For other address spaces, the address is the last address referenced **minus** one.
- * (asterisk) — The location last referenced in a DEPOSIT or EXAMINE command.
- @ (at sign) — The location addressed by the last location referenced in a DEPOSIT or EXAMINE command.

Data

- The data is specified as a hexadecimal number. The default number is zero.

B.2.5 DTE

>>> DTE

Converts the system into a dumb terminal emulator. This command is used when the boot node (server) needs a remote operator's console to run tests, boot the system, or whatever the regular operator's console is used for. If the boot node is a model 40 VS 3100 system, the DTE switch on the back of the system box must be set to the up position before entering this command on the remote console. The boot node must also be plugged into the printer port on the back of the system box.

An * is added to the console prompt >>> when in the DTE command is entered to indicate that you are operating the boot node. Press Ctrl P to return to normal console mode.

B.2.6 EXAMINE

>>> EXAMINE [<qualifier>] [<address>]

Examines the contents of the specified address. If no address is specified, + is assumed. The address may also be one of the symbolic addresses described in deposit.

Qualifiers

Same qualifiers as deposit.

Address

Same address specifications as deposit.

The response is in the form: <address space><address><data>

B.2.7 FIND

>>> FIND [<qualifier>]

The console program searches main memory starting at address zero for a page-aligned 64 Kbyte segment of good memory or a restart parameter block (RPB). If the segment or block is found, its address plus 512 is left in the SP. If the segment or block is not found, an error message is issued and the contents of the SP are unpredictable. If no qualifier is specified, /RPB is assumed.

Qualifiers

- /Memory

  Searches memory for a page-aligned 64 Kbyte segment of good memory. The search includes a read/write test of memory and leaves the contents of memory unpredictable.

- /RPB

  Searches memory for a restart parameter block. The search leaves the contents of memory unchanged.

B.2.8 HALT

>>> HALT

The console prompt >>> is displayed. No action is taken.

B.2.9 HELP

>>> HELP

Brings up a summary of the console commands.

B.2.10 INITIALIZE

>>> INITIALIZE

A processor initialization is performed. The following registers are set (all values are hexadecimal).

Register	Value	Register	Value
PSL	041F.0000	IPL	1F
ASTLVL	4	SISR	0
ICCS	0	RXCS	0
TXCS	80	MAPEN	0

All other registers are unpredictable.

The defaults used to fill in unsupplied qualifiers for DEPOSIT and EXAMINE commands are set to physical address, longword size, and address 0.

B.2.11 REPEAT

>>>REPEAT <command>

The console program repeatedly displays and executes the specified command. The repetition is stopped when you type Ctrl C. Any valid console command may be specified for the command with the exception of the repeat command.

B.2.12 SET

>>> SET <parameter-name> <value>

Set the console NVR parameter to the indicated value. The following console parameters and their acceptable values are defined:

Parameter-name

- BOOT — Set the default boot device. The value must be a valid boot device name as specified by the boot command. The only validation done is to verify the fourth character in the device name is a decimal number between zero and nine. Entering "." resets the boot device to the default value which is ESA0.

  Value

  - DKAx00 — RZ23, RZ24, or RZ55 on SCSI-A bus at address ID x (0 to 7)
  - MKAx00 — Tape drive on SCSI-A bus at address ID x (0 to 7)
  - DUA2 — RX23 is system box on model 30 systems only
  - ESA0 — Ethernet booting device.
  - DKBx00 — RZ23, RZ24, or RZ55 on SCSI-B bus at address ID x (0 to 7)

  - MKBx00 — Tape drive on SCSI-B bus at address ID x (0 to 7)
  - "." — Resets boot device to the ESA0 default device.
- BFLG — Set the default boot flags. The value must be a hexadecimal number of up to eight characters. The value entered is not checked for validity.
- HALT — Set the default halt action code. This code specifies the default action the console should take for all error halts and power up halts. The default value is stored in nonvolatile RAM and is retained across power cycles. If the nonvolatile RAM fails for any reason, the console initializes this field to the value of 2 (boot).

  Value

  - A 1 sets the default action to restart.
  - A 2 sets the default action to boot.
  - A 3 sets the default action to halt.
- KBD — Set the console keyboard layout to 1 of the 16 supported as follows:

  Value

  - A 0 sets the keyboard layout to Dansk.
  - A 1 sets the keyboard layout to Deutsch.
  - A 2 sets the keyboard layout to Deutsch (Schweitz).
  - A 3 sets the keyboard layout to English.
  - A 4 sets the keyboard layout to English (British/Irish).
  - A 5 sets the keyboard layout to Espanol.
  - A 6 sets the keyboard layout to Francais.
  - A 7sets the keyboard layout to Francais (Canadien).
  - An 8 sets the keyboard layout to Francais (Suisse Romande).
  - A 9 sets the keyboard layout to Italiano.
  - A 10 sets the keyboard layout to Nederlands.
  - An 11 sets the keyboard layout to Norsk.
  - A 12 sets the keyboard layout to Portugues.
  - A 13 sets the keyboard layout to Suomi.

- A 14 sets the keyboard layout to Svenska.
- A 15 sets the keyboard layout to Vlaams.

- MOP — Set the network listener to be enabled or disabled. The only acceptable values for this are listed as follows. If the Ethernet self-test had failed, then this command is an illegal command. If the nonvolatile RAM fails for any reason, the default value is set to 1 (enabled).

  Value

  - A 0 disables the network listener.
  - A 1 enables the network listener.

- PSWD — Set the password for remote trigger verification. This allows a user to set the password that will be verified if a remote trigger is received by the network listener. An illegal command will be displayed if the Ethernet self-test has failed or remote triggers are not enabled. In order to set a new password, the password must be known unless it is the first time a password is set, in which case only a new password need be specified. There is no corresponding SHOW command. For security reasons, the password is one-way encrypted and cannot be displayed.

- SCSIA — Set the SCSI address ID of the SCSI-A controller. The address ID of the controller should be an ID of 6. However, the address ID can be changed for whatever reason using this command. Valid address IDs are 0 to 7. Enter **>>> SCSIA 6** to set the controller's ID to 6.

- SCSIB — Set the SCSI address ID of the SCSI-B controller. The address ID of the controller should be an ID of 6. However, the address ID can be changed for whatever reason using this command. Valid address IDs are 0 to 7. Enter **>>> SCSIB 6** to set the controller's ID to 6.

- TRIG — Set the remote trigger to be enabled or disabled. This allows a remote system to request a local boot of the system. If the Ethernet self-test has failed, then this is an illegal command. If the nonvolatile RAM fails for any reason, the default value is set to 0 (disabled, remote trigger is not allowed).

B.2.13 SHOW

>>> SHOW <parameter-name>

The SHOW command displays information about the parameter indicated.

Parameter-name

- BOOT — Displays the default boot device as defined in the previous SET command above. An empty field appears as "...".
- BFLG — Displays the default boot flags. If no flags are specified, then 00000000 is displayed.
- DEVICE — Displays the devices currently operating in the system including the drives and their SCSI address IDs on the SCSI buses.
- ESTAT — Displays the screens associated with the last execution of the system exerciser test. This command is provided as a means of determining the state of the system test if an abnormal error occurs which causes the system exerciser test to either wait or halt. It provides no more information than is available at the normal completion of the system exerciser test. T 55 performs the same task as show estat.
- ETHERNET — Displays the hardware Ethernet address. The Ethernet address ROM is validated and is displayed as ID YY-YY-YY-YY-YY-YY where YY is a valid two digit hexadecimal number. If the Ethernet address ROM is invalid, then ID XX-XX-XX-XX-XX-XX is displayed to indicate that the Ethernet address ROM is not valid.
- HALT — Displays the default action code.
- KBD — Displays the console keyboard type. The value displayed for this parameter is the same one for the previous SET command above.
- MEM — Displays information concerning the KA-42 system memory. The format of the display is as follows:

```
>>> SH MEM
    00400000
    00000000
    003fd400:003fffff
```

Where: The first eight-character field displays the total amount of memory in the system including the console data structures. The second eight- character field shows the first address of 256 Kbytes of contiguous memory, generally used by VMB. The final line of the display shows the address range of the area of memory that is not available to the operating system. This includes the area of memory that is reserved for use by the console program. This field will be

repeated as many times as needed to display all of the address ranges that are not available to the operating system.

- MOP — Displays the state of the enabled network listener bit. If the value returned is 0, then the network listener is disabled. If the state of the value returned is 1, then the listener is enabled. If the Ethernet tests fail, then this command is an illegal command.
- TRIG — Displays the state of remote trigger enable. If the value returned is 0, then remote trigger are not allowed. If the state of the returned is 1, then remote triggers are allowed provided the remote trigger password is set correctly. If the Ethernet tests fail, then this command is an illegal command.
- VER — Displays information concerning the revision levels of four separate sections of program code within the system module ROMs. These sections are the self-test code, console code, VMB code, and the ROM code. All four sections have different internal revision levels. Enter **SHOW VER** to see the internal revision levels of the self-test, console, VMB, and ROM code displayed next to the KA42-B. The following is an example of these revision levels:

```
>>> SHOW VER

KA42-B V0.17C-0BF-V2.1-239
       PST: 0BF
       CON: 17C
       VMB: V2.1
       ROM: 239
```

Where: The V0.17C is for the self-test revision level, 0BF is the console code revision level, V2.1 is for the VMB revision level, and 239 is the ROM code revision level.

B.2.14 START

>>> START [<address>]

The console program starts instruction execution at the specified address. If no address is given, the current content of the PC is used. If no qualifier is present, macroinstruction execution is started. If memory mapping is enabled, macroinstructions are executed from virtual memory. The START command is equivalent to a deposit to PC followed by a CONTINUE command. No initialize is performed.

B.2.15 TEST

>>> TEST [<test number>]

The console program invokes a diagnostic test program specified by the test number. Test numbers for Field Service diagnostics are rejected if the loopback connector is not installed on the far right MMJ connector. Some of the test numbers are used to invoke utilities. See Appendix A for a description of the test numbers.

B.2.16 UNJAM

>>> UNJAM

A system reset is performed.

B.2.17 TRANSFER

>>> X <address><count><RETURN><data stream><checksum>

Transfers binary data to and from physical memory. This command is used by automatic systems communicating with the console program. It is not intended for operator use. The console program writes or reads in memory the specified number of data bytes, starting at the specified address.

Address

The physical address the binary data is transferred to or from. It is specified as a hexadecimal number.

Count

The number of bytes to be transferred. It is specified as a hexadecimal number. If the high order bit of the count is one, the data is transferred (read) from physical memory to the console device. If the high order bit is zero, the data is transferred (written) from the console device to physical memory.

RETURN

A carriage return.

Data stream

"Count" bytes of binary data.

Checksum

The two's complement checksum of the command string or data stream. The checksum is one byte of data expressed as a two digit hexadecimal number.

B.3 Special Keys

Table B–1 Special Keys Used in Console Program Mode

Special Key	Explanation of use
Return	Terminates the command line so the console program can execute the command.
(X) (DELETE)	This is used to delete single characters within a command line. On video terminals and video monitors, the character(s) deleted disappears (the console program sends a BS/SP/BS). On hardcopy terminals, the deleted characters are retyped after a backslash delimiter as they are deleted. For unknown attached console devices, the console program assumes they are hardcopy.
Ctrl C	Aborts the current command. The current program mode PC will be displayed, and the console prompt >>> is displayed on the next line. The console program echoes this as ^C.
Ctrl O	Causes the console program to throw away transmissions to the console device until the next Ctrl O is entered. Ctrl O is echoed as ^O when it disables output, but is not echoed when it reenables output. Output is reenabled if the console program prints an error message or if the console prompts for a command from the console device. Output is also enabled by entering program I/O mode, and by Ctrl C. Ctrl O clears Ctrl S.
Ctrl R	Retypes the current command line. Deleted characters are not displayed.
Ctrl S and Ctrl Q	The console program supports Ctrl S and Ctrl Q on both the normal and attached console devices. These keys are equivalent to the corresponding line pacing control characters XOFF and XON. Characters received between the XOFF/XON pair may be ignored. The hold screen key on the normal console device is not used for line pacing.

Table B–1 (Cont.) Special Keys Used in Console Program Mode

Special Key	Explanation of use
Ctrl U	Ignores the current command line. The console prompt >>> is displayed on the next line. This only affects entry of the current line. The console program echoes this as ^U. Pressing Ctrl U when a command is executing does not abort the command.

C

Console Messages and Explanations

Table C–1 Console Error Messages

Message	Explanation
02 EXT HLT	External halt
04 ISP ERR	Attempt to push interrupt or exception state onto the interrupt stack when the interrupt stack is mapped NO ACCESS or NOT VALID.
05 DBL ERR	A second machine check occurred while the processor was attempting to report a machine check to the operating system.
06 HLT INST	The processor executed a halt instruction in kernal mode.
07 SCB ERR3	Vector bits <1:0> = 3
08 SCB ERR2	Vector bits <1:0> = 2
0A CHM FR ISTK	A change mode instruction was executed when PSL<IS> was set.
0B CHM TO ISTK	Exception vector bit <0> was set for a change mode.
0C SCB RD ERR	A hard memory error occurred during a processor read of an exception or interrupt vector.
10 MCHK AV	An access violation or invalid translation occurred during machine check exception processing.
11 KSP AV	An access violation or invalid translation occurred during invalid kernel stack pointer exception processing.
12 DBL ERR2	Double machine check error
13 DBL ERR3	Double machine check error
19 PSL EXC5	PSL26:24 = 5 on interrupt or exception
1A PSL EXC6	PSL26:24 = 6 on interrupt or exception

Table C–1 (Cont.) Console Error Messages

Message	Explanation
1B PSL EXC7	PSL26:24 = 7 on interrupt or exception
1D PSL REI5	PSL26:24 = 5 on rei
1E PSL REI6	PSL26:24 = 6 on rei
1F PSL REI7	PSL26:24 = 7 on rei
20 TOY ERR	Time-of-year (TOY) clock failure.
21 CORRPTN	The console database is corrupted. The console simulates a power-up sequence and rebuilds its database.
22 ILL REF	The requested reference violates virtual memory protection and the address is not mapped. Either the reference is not valid in the specified address space or the value is not valid in the specified destination.
23 ILL CMD	The command string cannot be parsed.
24 INV DGT	A number has an invalid digit.
25 LTL	The command is too large for the console to buffer.
26 ILL ADR	The specified address is not in the address space.
27 VAL TOO LRG	The specified value does not fit in the destination.
28 SW CONF	Conflicting switches. For example, an EXAMINE command that specifies two different data sizes.
29 UNK SW	The switch is not recognized.
2A UNK SYM	The examine or deposit symbolic address is not recognized.
2B CHKSM	Either the whole transfer (X) command or just the <data> portion of the TRANSFER command is not valid.
2C HLTED	The operator entered the HALT command.
2D FND ERR	A FIND command failed to find either the RPB or 64 Kbytes of good memory.
2E TMOUT	Data failed to arrive in the expected time during a transfer (X) command.
2F MEM ERR	Parity or other memory error detected.
30 UNXINT	An unexpected interrupt or exception occurred.
40 NOSUCHDEV	VMB message: No bootable device found.

Table C–1 (Cont.) Console Error Messages

Message	Explanation
41 DEVASSIGN	Device is not present.
42 NOSUCHFILE	Program image is not found.
43 FILESTRUCT	Invalid boot device file structure
44 BADCHKSUM	Bad checksum on header file
45 BADFILEHDR	Bad file header
46 BADIRECTORY	Bad directory file
47 FILNOTCNTG	Invalid program image file
48 ENDOFFILE	Premature end-of-file encountered.
49 VADFILENAME	Bad file name given.
4A BUFFEROVF	Program image does not fit in available memory.
4B CTRLERR	Boot device I/O error
4C DEVINACT	Failed to initialize boot device.
4D DEVOFFLINE	Device is off-line.
4E MEMERR	Memory initialization error
4F SCBINT	Unexpected SCB exception or machine check
50 SCBZNDINT	Unexpected exception after starting program image
51 NOROM	No valid ROM image found.
52 NOSUCHNODE	No response from load server.
53 INSFMAPREG	Invalid memory configuration
54 RETRY	No devices bootable, retrying.
55 NOWRT	Device is read-only or write locked.
56 DUPIDENT	Duplicate SCSI ID for device and CPU
57 DEVCMDERR	DEVICE command error
58 ILLIOFUNC	Illegal I/O function
81 SUCCESS	Success
82 CVAXSTAR	Power-up message
83 BOOT SYS	Bootstrapping
84 FAIL	General failure

Table C–1 (Cont.) Console Error Messages

Message	Explanation
85 RESTART SYS	Restarting system software.
86 TESTING	Running diagnostics.
87 TESTING_SP	A white space message to format countdown.
88 TESTING_DONE	Diagnostic conclusion
89 IMPOSSIBLE	Operation is impossible.
8A PC_STR	PC introduction on halt display.
8B BKSP_DELETE	Backspace delete sequence
8C CRLF	Simple CRLF
8D CTRLC	Control C message
8E CTRLU	Control U message
8F CTRLO	Control O message
90 DA_QUERY	Device attribute request
91 TERMINIT	Terminal initialization
92 APT_PROMPT	Promt to APT
93 LK201_RESP	Console language response prompt
99 PROMPT	Console prompt text
9A BOOTFILE	Bootfile prompt message
9B PARMFILE	Ethernet parameter file prompt message
9C RMT TRGGR	Bootstrap triggered remotely.

D

VMB Boot Error Status Codes

Figure D–1 shows the two types of VMB error displays. PC indicates the contents of the program counter at the time of the error, R0 indicates the contents of register 0 (VMB boot error status codes listed in Table D–1) at the time of the error, and PSL indicates the contents of the program status longword.

Each error code's lower three bits (hexadecimal) represent a severity level and may be changed by the software. For example, 000001F4 is a parity error and represents an error status, but 000001F0 through 000001F7 also represent parity errors of varying severity. Therefore, the error code numbers listed in Table D–1 represent the typical value of each error code.

```
1) Generic error message where R0 is a status code.

 %VMB-F-ERR, PC = nnnnnnnn
 %VMB-I-STS, R0 = nnnnnnnn

2) Unexpected exception. These represent internal VMB errors.

 %VMB-F-SCBINT, PC = nnnnnnnn, PSL = nnnnnnnn
        OR

 %VMB-F-SCBINT2, PC = nnnnnnnn, PSL = nnnnnnnn
```

Figure D–1 VMB Error Displays

Table D–1 VMB Boot Error Status Codes

Error Code	Mnemonic	Definition
00000001	SS$_NORMAL	Normal successful completion
00000054	SS$_CTRLERR	Fatal controller error
00000084	SS$_DEVOFFLINE	Device is not in configuration or not available.
0000008C	SS$_DRVERR	Fatal drive error
000000DC	SS$_ILLBLKNUM	Illegal logical block number
000001A4	SS$_MEDOFL	Medium is off-line.
000001AC	SS$_NODATA	Mailbox is empty.
000001F4	SS$_PARITY	Parity error
0000022C	SS$_TIMEOUT	Device timeout
0000028C	SS$_NOSUCHNODE	Remote node is unknown.
000002AC	SS$_FILNOTCNTG	File is not contiguous as required.
00000344	SS$_INSFMAPREG	Insufficient map registers
00000601	SS$_BUFFEROVF	Output buffer overflow
00000808	SS$_BADCHKSUM	Bad file header checksum
00000810	SS$_BADFILEHDR	Bad file header
00000818	SS$_BADFILENAME	Bad file name syntax
00000828	SS$_BADIRECTORY	Bad directory file format
00000848	SS$_DEVASSIGN	Device has channels assigned
00000870	SS$_ENDOFFILE	End of file
000008C0	SS$_FILESTRUCT	Unsupported file structure level
00000908	SS$_NOSUCHDEV	No such device available
00000910	SS$_NOSUCHFILE	No such file
000020D4	SS$_DEVINACT	Device is inactive.
00002144	SS$_FORCEDERROR	Forced error flagged in last sector read
00008000	SS$_MEMERR	No good pages of memory found.
00008018	SS$_NOROM	System exerciser not present.

E

Power-Up and Self-Test Error Codes

This appendix lists all of the power-up and self-test error codes. There is no difference between the power-up error codes and the self-test error codes. Table E–1 lists the contents of this appendix by sections.

Table E–1 Failing Test/Device Section Listings

Failing Test/Device	Section
Test F - Monochrome circuits (MONO)	E.1
Test E - TOY clock (CLK)	E.2
Test D - Nonvolatile RAM (NVR)	E.3
Test C - Serial line controller (DZ)	E.4
Test B - System memory (MEM)	E.5
Test A - Memory management (MM)	E.6
Test 9 - Floating point (FP)	E.7
Test 8 - Interval timer (IT)	E.8
Test 7 - RX23 drive controller (STRG-1) (model 30)	E.9
Tests 6 and 7 - SCSI bus controller (SCSI-A and SCSI-B)	E.10
Test 5 - Interrupt controller and Ethernet ID ROM (SYS)	E.11
Test 4 - 8-plane graphics option (8PLN)	E.12
Test 3 - Not supported	
Test 2 - Not supported	
Test 1 - Ethernet network (NI)	E.13

E.1 Monochrome Video Circuits (MONO)

Error code format: 0000.XXXX

Where XXXX is one of the codes listed in Table E–2.

Table E–2 Monochrome Video Error Codes (0000.XXXX)

Error Codes	Definition
0001	No error
0010	End of frame bit not set in interrupt pending register.
0020	End of frame failed to set for the second time.
0040	End of frame failed to set for the third time.
0080	No end of frame interrupt seen.
0100	Wrong IPL level for EOF interrupt.
0200	Interrupt request failed to clear interrupt pending register bit.
0400	End of frame interrupt did not occur.
0800	Error during cursor test

E.2 Time-Of-Year Clock (CLK)

Error code format: 0000.XXXX

Where XXXX is one of the error codes listed in Table E–3.

Table E–3 Time-Of-Year Clock (0000.XXXX)

Error Codes	Definition
0001	No error
0003	Tell dispatcher to check time at the end of the testing.
0004	Invalid time set
0005	Clock has not been reset since the last time that battery voltage level was low.
0010	Failure in time-of-year test
0020	Vrt bit failed to set after it was read the first time.
0040	Battery voltage level was down during the clock test.

E.3 Nonvolatile RAM (NVR)

Error code format: 0000.XXXX

Where XXXX is one of the codes listed in Table E–4. An error code of 5 indicates that the battery voltage is below an acceptable level for data in the NVR to be valid.

Table E–4 Nonvolatile RAM Error Codes (0000.XXXX)

Error Codes	Definition
0001	No error
0004	Battery was down at last entry.
0008	NVR failed.
0080	The battery check code in the NVR did not aggree with the expected check code.

E.4 Serial Line Controller (DZ)

Error code format: 0000.XXXX

Where the XXXX is one of the error conditions listed in Table E–5.

The second line of six codes under the DZ error code contains the status of each serial line as well as the status of the keyboard and mouse. This second line of status codes is provided so a failing serial line can be isolated. The status codes in the second line have the following format:

```
0000WWWW 0000WWWW 0000WWWW 0000WWWW YYYYYYYY ZZZZZZZZ
line 0   line 1   line 2   line 3   keyboard mouse
```

Where WWWW is one or more of the status codes listed in Table E–6, YYYYYYYY is the keyboard internal self-test code listed in Table E–7, and ZZZZZZZZ is the mouse or tablet internal self-test code listed in Table E–8.

Table E–5 Serial Line Controller (0000.XXXX)

Error Codes	Definition
0001	No error
0002	Master reset failed
0004	Failure in basic CSR test
0008	Failure in CSR read write test
0010	Basic test of TCR failed
0020	Read write test of TCR failed
0040	Transmitter ready test failed
0080	Receiver ready test failed
0100	Transmitter interrupt timeout
0200	Receiver interrupt timeout
0400	Either transmitter or receiver interrupted at the wrong priority.
0800	Receiver interrupt occurred when the receiver was not enabled.
1000	Data comparison error
2000	Overrun error did not happen.
4000	This line is untested.
8000	Error in the modem control logic test.

Table E–6 Serial Line Status Codes (0000WWWW)

Status Code	Definition
0001	Serial line tested successfully.
4000	Serial line is untested.

Table E–7 Keyboard Self-Test Codes (YYYYYYYY)

Status Code	Definition
00000000	No keyboard is connected.
00000001	Keyboard connected and tested successfully.
000000FD	Loopback connected and tested successfully.

Table E–8 Mouse or Tablet Self-Test Codes (ZZZZZZZZ)

Status Code	Definition
00000000	No mouse or tablet is connected.
000012A0	Mouse or tablet connected and tested successfully.
00000054	Loopback connected and tested successfully.

E.5 System Memory (MEM)

Error code format: 0000.XXXX

Where XXXX is one of the codes listed in Table E–9. These codes show the error/staus information for the memory on the system module and also the option memory module. The second line under the MEM code contains additionl information on the memory in the system. These additional codes have the following format:

Second line status code format: YYYYYYYY ZZZZZZZZ

Where YYYYYYYY is the total number of bytes of good memory found in the system. If this field is not in an even Mbyte value (for example, 00020000) then the second field, ZZZZZZZZ, is displayed to indicate the failing Mbyte bank. Each bit in the ZZZZZZZZ status code indicates the status for one bank of memory. In some cases, where a parity error is detected, the error may be on both the system module and the option memory module.

Table E–9 System Memory Error Codes (0000.XXXX)

Error Codes	Definitions
0001	No error
0002	Failure in test address routine
0004	Byte mask failure
0008	Data/address test failure
0010	No memory was found during sizing
0020	Unexpected parity error

E.6 Memory Management (MM)

Error code format: 0000.000X

Where X is one of the codes listed in Table E–10.

Table E–10 Memory Management Error Codes (0000.000X)

Error Codes	Definition
1	No error
4	Memory management error
8	Illegal vector during MM test

E.7 Floating Point (FP)

Error code format: 0000.000X

Where X is one of the error codes listed in Table E–11.

Table E–11 Floating Point Error Codes (0000.000X)

Error Codes	Definition
0002	Floating point error
0004	Invalid floating point exception

E.8 Interrupt Controller (IT)

Error code format: 0000.000X

Where X is either a 2 for a fatal error or a 1 for a success.

E.9 RX23 Controller (STRG-1) (Model 30)

Error code format: VWXY.000Z

Where the V indicates the status of DUA0, the W indicates the status of DUA1, the X indicates the status of DUA2, Y indicates the status of DUA3, and the Z indicates the status of the RX23 controller on the MSC module. DUA0, DUA1, and DUA3 are not used and the status codes should be a 7 (off-line). Table E–12 lists the self-test error codes that appear for the controller bit (Z). Table E–13 lists the self-test error codes that appear for the RX23 drive bits (X).

If the RX23 controller has an error, the RX23 drive is not tested and a code of F is given to all the device codes. Also, the errors listed in Table E–13 may indicate a problem in the controller.

The second line for the STRG-1 indicates the size, in Mbytes, of the media loaded in the RX23.

Table E–12 Controller Code (0000.000Z)

Error Codes	Definition
2	Timeout in reset routine or invalid status was returned.
4	Waiting for completion, but did not happen. Finished test part 1.
8	Waiting for completion, but did not happen. Finished test part 2.
A	Failure in one of the buffer tests.

Table E–13 Drive Code (VWXY.0000)

Error Codes	Definition
Fatal drive errors	
2	Desired drive did not match selected drive or the status returned from the controller was not valid. This could either be the drive or the controller.
4	Read after write error. The read after the write operation failed. This is fatal because the data are written to the DBN which is guaranteed to be error free.
6	Drive failed to restore. This considered fatal because drive selection was acknowledged properly.
8	Done failed to set within a certain period after issuing the command.
A	Drive select timeout error - this is considered fatal since the controller should at least respond with bad status from the drive. Drive acknowledge was never seen from the hard disk.
C	Internal test error. An invalid block number was given to the read block routine.
E	Internal test error. An invalid XBN block number was given to the read block routine.
Nonfatal drive errors	
3	Read error during read test only
5	Invalid UIB. This may be because the drive is not formatted.
7	No drive available. This is a nonfatal error after doing a drive selection.
9	Invalid status returned from the controller.
F	Drive untested due to fatal controller error.

E.10 SCSI Bus Controller (SCSI-A and SCSI-B)

This section includes the codes for all of the SCSI bus controllers on all VS 3100 systems.

Error code format: WWXX.YYZZ

Where WW is the bit mask field of the devices selected successfully on the SCSI bus (Table E–14), XX is the bit mask fields of the devices that tested successfully (Table E–14), YY is a set of bitmap error flags (Table E–15), and ZZ is the status/error code of the SCSI controller on the MSC module (Table E–16).

Second line error code format: DDMMSSTT

Where the DD is the status of the data in phase on the INQUIRY command, MM is the status of the message in phase of the INQUIRY command, SS is the status of the status phase of the INQUIRY command, and TT is the status of the devices on the SCSI bus. All of these status codes are identical and are listed in Table E–17.

The second line of code indicates the status of the eight possible devices on the SCSI bus including the controller on the MSC module. The first code in this second line is reserved for the SCSI controller on the MSC module and the second through eight code is for the devices connected to the SCSI bus.

Table E–14 Binary Mask of Selected Devices (WWXX.0000)

Binary Mask	Device ID	As Seen on the Screen
0000 0001	0	01
0000 0010	1	02
0000 0100	2	04
0000 1000	3	08
0001 0000	4	10
0010 0000	5	20
0100 0000	6	40
1000 0000	7	80

Table E–15 Binary Mask of Error Flags (0000.YY00)

Binary Mask	Definition	As Seen on the Screen
0000 0001	Problem is on the system module.	01
0000 0010	Problem is not on the system module.	02
0001 0000	Reset is required to free SCSI bus.	10
0010 0000	Not all selected devices are operating properly.	20
0100 0000	DMA and interrupts are untested.	40

Table E–16 SCSI Controller's Error Codes (0000.00ZZ)

Error Codes	Definition
01	No error
02	Data buffer RAM addressing failure
04	Data buffer RAM byte mask failure
06	Data buffer data path failure
10	Error in SCSI controller registers during reset
12	Error in SCSI controller registers after reset
20	Unexpected interrupt after reset, IPL = 1F
22	No interrupt request after reset
24	No interrupt after reset when IPL has been lowered.
26	Interrupt request not cleared following ISR (after reset).
28	Multiple interrupts following reset.
2A	Unknown interrupt following reset.
2C	Wrong interrupt following reset.
30	Phase not bus free at start of test.
40	First attempt to read SCSI controller's registers failed.
42	SCSI controller register address test failed at ini_cmd.
44	SCSI controller register address test failed at mode.
46	SCSI controller register address test failed at tar_cmd.
48	SCSI controller register address test failed at scd_cnt.

Table E–16 (Cont.) SCSI Controller's Error Codes (0000.00ZZ)

Error Codes	Definition
4A	Mode (DMA) found set after being cleared when ini_cmd(bsy) clear.
4C	Mode (DMA) found set after being set when ini_cmd(bsy) clear.
4E	Mode (DMA) found set after being cleared when ini_cmd(bsy) set.
50	Mode (DMA) found clear after being set when ini_cmd(bsy) set.
60	Data output to bus with ini_cmd(enout) clear
62	No data to bus with ini_cmd(enout) set
64	Parity bit cur_stat(dbp) did not match data on bus.
66	With bus free, data in did not match data out.
68	ini_cmd(sel) to cur_stat(sel) mismatch
6A	ini_cmd(ack) to status(ack) or ini_cmd(atn) to status(atn) mismatch
6C	Tar_cmd(req) to cur_stat(req) or tar_cmd(msg) to cur_stat(msg) or tar_cmd(cd) to cur_stat(cd) or tar_cmd(io) to cur_stat(io) mismatch with mode(targ) set
6E	Clearing mode(targ) does not prevent tar_cmd bits from appearing on the bus.
70	ISR hit with IPL = 1F and int_msk(sc) clear
72	Interrupt request int_req(sc) set for no reason.
74	SCSI bus status(intreq) set for no reason.
80	SCSI bus busy at start if interrupt test - no test done
82	ISR hit following bus free with IPL = 1F and int_msk(sc) clear
84	Interrupt request int_req(sc) not set following bus free
86	SCSI bus status(intreq) not set following bus free.
88	Status(bsyerr) not set after it caused an interrupt.
90	SCSI bus busy during interrupt test - no test done
92	ISR hit following bus free with IPL = 1F and int_msk(sc) set
94	Interrupt request int_req(sc) not set following bus free.
96	SCSI bus status(intreq) not set following bus free.
98	Status(bsyerr) not set following bus free.
A0	SCSI bus busy during interrupt test - no test done

Table E–16 (Cont.) SCSI Controller's Error Codes (0000.00ZZ)

Error Codes	Definition
A2	Timeout waiting for bus free interrupt.
A4	ISR not hit following bus free.
A6	Interrupt request int_req(sc) not cleared following ISR after bus free.
A8	SCSI bus status(intreq) not set following bus free.
AA	Multiple interrupts from bus free
AC	Unknown interrupt from bus free
AE	Wrong interrupt from bus free
B0	SCSI bus busy during interrupt test - no test done.
B2	Timeout waiting for parity interrupt.
B4	ISR not hit following parity.
B6	Interrupt request int_req(SC) not cleared following ISR after parity.
B8	SCSI bus status(intreq) not set following parity.
BA	Multiple interrupts from parity
BC	Unknown interrupt from parity
BE	Wrong interrupt from parity
C0	Phase is not bus free before arbitration.
C2	Ini_cmd(aip) bit failed to set.
C4	Lost arbitration (first check of ini_cmd(la))
C6	Higher priority device in bus
C8	Lost arbitration (second check of ini_cmd(la))
D0	Not all selected targets tested satisfactory.

Table E–17 Device Status Codes (DDMMSSTT)

Status Codes	Definition
FF	Device is untested.
01	No error
03	This device is reserved by the host (SCSI controller).
05	Device did not respond to selection.
10	Device did not set cur_stat(req) soon enough when changing phase.
12	Jitter on the phase lines when changing phase.
20	Device set command phase twice.
22	Device changed phase before command complete.
24	Device failed to set cur_stat(req) when getting command.
26	Device failed to clear cur_stat(req) when getting command.
28	Command phase out of sequence
2A	Stuck in command phase
30	Device set data in phase twice.
32	Device failed to set cur_stat(req) when returning data.
34	Device failed to clear cur_stat(req) when returning data.
36	Device changed data in phase before transferring any data.
38	Data in phase out of sequence
3A	Stuck in data in phase
40	Target set status phase twice.
42	Target failed to set cur_stat(req) when returning data.
44	Target failed to clear cur_stat(req) when returning data.
46	Target changed status phase before transferring any data.
48	Staus phase out of sequence
4A	Stuck in status phase
50	Target set message in phase twice.
52	Target failed to set cur_stat(req) when returning data.
54	Target failed to clear cur_stat(req) when returning data.
56	Target changed message_in phase before transferring any data.

Table E–17 (Cont.) Device Status Codes (DDMMSSTT)

Status Codes	Definition
58	Message in phase out of sequence
5A	Stuck in message in phase
60	Target set data out phase (unexpectedly)
62	Target set phase to 100b (reserved phase)
64	Target set phase to 101b (reserved phase)
66	Target set message out phase
68	Selected target did not set any phase before releasing bus.
70	Target not following expected phase sequence.
72	Parity error detected during programmed I/O transfer.
80	Unexpected interrupt at start of DMA test
90	Target failed to set command phase.
92	Unexpected interrupt at start of command phase in DMS test
94	Timeout waiting for DMA complete in command phase in DMA test.
96	No DMA end following command phase in DMA test.
98	Wrong interrupt following command in DMA test.
9A	Scd_cnt not zero following command in DMA test.
9C	DMA not complete after EOP command phase (ACK not clear soon enough).
A0	Status(dmaend) bit not cleared by clearing mode(dma) at start of data in phase in DMA test.
A2	Target failed to set data in phase in DMA test.
A4	Timeout waiting for DMA complete in data in phase in DMA test.
A6	No status(dmaend) following data in phase in DMA test.
A8	Wrong interrupt following data in phase in DMA test.
AA	Scd_cnt not zero following data in phase in DMA test.
AC	DMA not complete after eop in data in phase (ACK not clear soon enough).
B0	Status(dmaend) not cleared by clearing mode(dma) at start of status phase in DMA test.

Table E–17 (Cont.) Device Status Codes (DDMMSSTT)

Status Codes	Definition
B2	Target failed to set status phase in DMA test.
B4	Timeout waiting for DMA complete in status phase in DMA test.
B6	No status(dmaend) following status phase in DMA test.
B8	Wrong interrupt following status in DMA test.
BA	Scd_cnt not zero following status in DMA test.
BC	DMA not complete after EOP in status phase (ACK not clear soon enough).
C0	Status(dmaend) not cleared by clearing mode(dma) at start of message in phase in DMA test.
C2	Target failed to set message in phase in DMA test.
C4	Timeout waiting for DMA complete in message in phase in DMA test.
C6	No status(dmaend) following message in phase in DMA test.
C8	Wrong interrupt following message in phase in DMA test.
CA	Scd_cnt not zero following message in phase in DMA test.
CC	DMA not complete after EOP in message in phase (ACK not clear soon enough).
D0	Status(dmaend) not cleared by clearing mode(dma) at end of DMA test.
D2	SCSI bus not free soon enough at end of DMA test.

E.11 Interrupt Controller and Ethernet ID ROM (SYS)

Error code format: 0000.XXXX

Where XXXX is one of the codes listed in Table E–18.

Table E–18 Interrupt controller/Ethernet ID ROM Error Codes (0000.XXXX)

Error Codes	Definition
0001	No error
0002	System ROM failed checksum.
0004	Ethernet ROM failed checksum.
0008	No interrupts pending.
0010	All of the expected interrupts did not occur.
0020	Unexpected interrupt
0040	Improper priority
0080	Default interrupt service routine was called. An interrupt that was not enabled occurred.
0100	No keyboard found in the configuration.

E.12 8-Plane Graphics Module

Error code format: XXXX.YYYZ

Where XXXX is the status of the failing test (ignore this field), YYY one of the codes listed in Table E–19, and Z is a 1 to indicate no error, a 2 to indicate a fatal error, and a 3 to indicate a status message.

Table E–19 8-Plane Graphics Module Error Codes (0000.YYY0)

Error Code	Failing Test	Error Code	Failing Test
0001	No error	012Z	Packing/unpacking
001Z	Initialization	013Z	Compression/decompression
002Z	Chip select	014Z	Adder interrupt
003Z	Long memory	015Z	FCC interrupt
004Z	Memory	016Z	VDAC
005Z	ID data bus	017Z	Cursor
006Z	Scrolling	018Z	Sync readback
007Z	FCC initialization	019Z	Left edge detect readback
008Z	FCC RAM counters	020Z	Right edge detect readback
009Z	FCC RAM	021Z	Video readback
010Z	Display list commands	022Z	Cursor readback
011Z	Short display list	03AZ	Memory data path

E.13 Ethernet Circuits (NI)

Error code format: 0WXX.YYYY

Where W = 1 if no heartbeat present (0 = heartbeat present), XX is the number of retries over the Ethernet cable before a success and YYYY is one of the codes listed in Table E–20.

Table E–20 Ethernet Circuits Error Codes (0000.YYYY)

Error Codes	Definition	Error Codes	Definition
0001	No error	4008	Bad filter value
1002	Failed initialization	400A	Initialization failed
1004	RX not enabled	400C	Failed loopback
1006	TX enabled	400E	Initialization failed
1008	Initialization failed	4010	Failed loopback
100A	RX enabled	5002	Initialization failed
100C	TX not enabled	5004	OWN not toggled
2002	Initialization failed	5006	No RTRY error
2004	Failed loop	5008	TX turned off
3002	Initialization failed	500A	Initialization failed
3004	Failed loop	500C	TX failed
3006	No CRC match	500E	No RCV MISS
3008	Initialization failed	6002	Initialization failed
300A	Failed TX	6004	Loopback failed
300C	Failed RX	6006	Bad CSR0
300E	Initialization failed	6008	No NI interrupt
3010	Failed TX	600A	Initialization failed
3012	OWN not toggled	600C	Loopback failed
3014	No RX error	600E	Wrong number of interrupts
3016	No STP	6010	NI interrupts bits set
3018	No ENP	7002	Initialization failed
301A	No CRC error	7004	OWN not toggled
301C	No FRAM error	7006	No BUFF error
301E	No RINT	7008	TX still on
4002	Initialization failed	700A	Initialization failed
4004	Failed TX	700C	TX failed
4006	Packet received	700E	RX failed

F

System Exerciser Error Codes

This appendix lists the status and error codes for the system exerciser. When examining the exerciser report, a single question mark (?) indicates a soft error, two question marks (??) indicate a hard error. The absence of question marks indicates success. Table F–1 lists the contents of this appendix by sections.

Table F–1 Failing Test/Device Section Listings

Failing Test/Device	Section
Test F - Monochrome circuits (MONO)	F.1
Test C - Serial line controller (DZ)	F.2
Test B - System memory (MEM)	F.3
Test 7 - RX23 drive controller (STRG-1 on model 30)	F.4
Tests 6 and 7 - SCSI bus controller (SCSI-A and SCSI-B)	F.5
Test 4 - 8-plane graphics option (8PLN)	F.6
Test 1 - Ethernet network (NI)	F.7

F.1 Monochrome Video Circuits (MONO)

Error code format: 000Y.XXXX

Where Y is the number 1 when an error is found (0 normally) and XXXX is one of the errors listed in Table F–2.

Table F–2 Monochrome Video Error Codes (0000.XXXX)

Error Codes	Definition
0001	No errors
0002	VDC register error
0003	Screen memory error
0004	Unexpected end-of-frame interrupt
0005	No end-of-frame interrupt
0006	Interrupt register error
0007	Cursor chip error
F001	System software error
F002	System software error
F003	System software error
F004	System software error
F005	System software error
F006	System software error

F.2 Serial Line Controller (DZ)

Error code format: 0LSS.ABCD

Where the 0LSS is the status code and the ABCD is the error code. The L indicates the serial line used by the console, the SS indicates whether the error code portion (.ABCD) is indicating a device hard error (FF), a system software error (0F), or the status of the four serial lines (00). The ABCD indicates either a device hard error (all four digits), a system software error (all four digits), or the serial line status (one digit for each of the four serial lines). When SS is 00, each letter in the ABCD code represents a status/error for each serial line: A represents line 3 (printer), B represents line 2 (printer), C represents line 1 (video port), and D represents line 0 (keyboard).

Table F–3 lists codes used to indicate the console (L). Table F–4 lists the serial line status codes for each of the four serial lines (ABCD) when SS is 00. Table F–5 lists the device hard error (ABCD) when SS is FF. When SS is 0F, system software error, the error codes in ABCD range from 0001 to 000B and are considered fatal.

Table F–3 Serial Line Console Codes (0L00.0000)

Code	Serial Line
0	Keyboard port
1	Video port
2	Printer port
3	Printer port

Table F–4 Each Serial Line's Status/Error Codes (0000.ABCD)

Error Codes	Definition
0	No error is detected for this line.
1	No character is received.
2	Failed to transmit all characters or transfer took too long or lost receive characters.
3	Too many characters received.
4	Character received not equal expected.
5	Parity, framing, or overrun error detected.
6	Baud rate timing error
7	Modem signals not equal expected
8	Overrun error not equal 0
9	Character received not equal expected.
A	Overrun error failed to set.
B	Framing error failed to set.
C	TxRdy bit failed to set.
D	Transmit line received not equal expected.
E	Interrupt request bit ST not set in INT_REQ register.
F	Interrupt request bit ST not cleared in INT_REQ register.

Table F–5 Fatal Device's Error Codes (00FF.ABCD)

Error Codes	Definition
0001	Interrupt mask register, INT_MSK, register bits ST or SR stuck at 1
Error Codes in READ_WRITE_REGISTER_TEST	
0002	Master clear failed to reset DZQ.
0003	CSR register: expected %x1028
0004	CSR register failed to clear.
0005	TCR register: expected %x0F0F
0006	TCR register failed to clear.
Error Codes in INTERRUPT_BITS_TEST	
0007	TRDY bit in CSR stuck at 1.
0008	TRDY bit in CSR failed to set.
0009	TRDY bit in CSR failed to clear after transmitting a character.
000A	TRDY bit in CSR failed to set after transmitting a character.
000B	RDONE bit failed to set after transmitting character in internal loopback mode.
000C	SR bit in INT_REQ register not set by RDONE.
000D	SR bit in INT_REG register not cleared by writing bit in INT_CLR register.
000E	Character received: 0 or line number not equal expected
000F	Data valid bit not set in word read.
0010	Silo alarm enable failed to set in CSR.
0011	Silo alarm failed to set after transmitting 16 characters in internal loopback.
0012	RDONE not set after 16 characters received.
0013	SR bit in INT_REQ register not set by silo alarm.
0014	Silo alarm failed to clear after reading a character from silo.
0015	Master clear failed to reset the DZQ.
0016	Unexpected transmit interrupt occurred with interrupt mask bit cleared.

Table F–5 (Cont.) Fatal Device's Error Codes (00FF.ABCD)

Error Codes	Definition
0017	Unexpected receive interrupt occurred with interrupt mask bit cleared.
Error codes for BASIC_INTERRUPT_TEST	
0018	INT_MSK register bit ST failed to set.
0019	Failed to receive a transmit interrupt.
001A	Transmit interrupt occurred with INT_MSK bit ST cleared.
001B	INT_MSK register bit SR failed to set.
001C	Failed to receive a receive interrupt.
001D	Receive interrupt occurred with INT_MSK bit SR cleared.
Error codes in BREAK_DETECT_TEST	
001E	TRDY failed to set after setting line enable for line in TCR register.
Error codes in OUTPTR_CHAR_POLLED	
001F	TRDY failed to set in allotted time.

F.3 System Memory (MEM)

Error code format: XXXX.00YZ

Where XXXX indicates the status code and Y and Z indicate the type of error. Table F–6 lists the codes.

When there is no error, the status code (XXXX.0001) indicates the number of pages tested at the time of the report. Otherwise, the status code indicates the failing test.

Table F–6 System Memory Error Codes (XXXX.00YZ)

Error Codes	Definition
0000.0001	Success—No error
0001.000F	System software error
0002.000F	System software error
0003.000F	System software error
0004.000F	System software error
0005.000F	System software error
0006.000F	System software error
0007.000F	System software error
0008.000F	System software error
0001.001F	Compare error on system module
0002.001F	Compare error on option module
0001.002F	Parity error on system module
0002.002F	Parity error on option module

F.4 RX23 Drive Controller (STRG-1 on Model 30)

Controller error code format: TUVV.XYZ1

Where the T indicates the drive used during the transfer test, the U indicates the results of the transfer test, the VV indicates the error count (in hexadecimal) during the transfer test, and the X, Y, and Z indicate the results of the interrupt test, register test, and the buffer test respectively. Table F–7 lists the drive numbers used during the transfer test (T). Table F–8 lists the error codes for the U, X, Y, and Z bit positions.

Drive error code format: JKLL.PRS1

Where the J indicates the drive number, the K indicates the status of the drive, the LL indicates the error count (in hexadecimal) for the drive. The P, R, and S indicate the status of the RX23 controller test, the termination code bit from the interrupt status port register, and the routine test respectively. Table F–7 lists the drive numbers (J). Table F–9 lists the codes for drive status (K). Table F–10 lists the RX23 controller status codes (P). Table F–8 lists the error codes for the routine status (S).

Table F–7 Transfer Test Drive Number (T000.0001) (J000.0001)

Code	Drive Used During Transfer Test
F	No drive is available for transfer testing.
3	DUA3—Not used
2	DUA2—RX23 diskette drive
1	DUA1—Not used
0	DUA0—Not used

Table F–8 RX23 Controller Test Error Codes (0U00.XYZ1) (0000.00S1)

Error Codes	Definition
0	Success—No error
1	Registers 0, 1, 2, or 3 not completely verified, rtcnt, invrdy, intrdch, ready, presdrv, int_done selack(l), skcom(h) not verified
2	Data path in longword, word, or byte access failed. Unable to verify all of data buffer, or data path to register 10 not verified.
3	DMA count error: count register not verified. Count is not 0 after DMA transfer.
4	Command is not finished before timeout.
5	Error in system interrupt logic
6	Unexpected interrupt before command issued
7	Command terminated with bad status.
8	RESTORE command terminated with error status.
9	STEP command terminated with error status.
A	SEEK command terminated with error status.
B	READ command terminated with error status.
C	WRITE command terminated with error status.
D	Unable to verify register sequencing in disk controller.
E	Drive not formatted (UIB, RCT not found. Bad media).
F	Data checksum is incorrect in transfer test.

Table F–9 Drive Status Code in 2nd Line (0K00.0001)

Status Codes	Definition
0	No error
1	Drive is formatted.
2	UIB and RCT are valid.
3	Drive is formatted and UIB and RCT are valid.
4	Drive is writable
5	Drive is formatted and writable.
6	UIB and RCT are valid and drive is writable.
7	Drive is formatted, writable, and UIB and RCT are valid

Table F–10 RX23 Controller Status Code in 2nd Line (0000.P001)

Status Codes	Definition
0	No error
1	CMP error
2	Sync error
3	Sync error and CMP error
4	ECC error
5	ECC error and CMP error
6	ECC error and Sync error
7	ECC error, Sync error, and CMP error
E	Error occured while revectoring
F	Revectored bad block

F.5 SCSI Bus Controller (SCSI-A and SCSI-B)

This section includes the codes for all of the SCSI bus controllers on all VS 3100 systems.

Controller code format: TUVV.XYZ1

Where the T indicates the SCSI address ID of the SCSI controller (should be a 6), the U indicates the results of the transfer test, the VV indicates the error count (in hexadecimal) during the transfer test. The X, Y, and Z indicate the results of the interrupt test, register test, and the buffer test respectively. Table F–11 lists the error codes for the U, X, Y, and Z bit positions.

Drive error code format: JKLL.PRS1

Where the J indicates the drive number (the SCSI bus address (1 through 7), the K indicates whether the drive is removable (1) or writable (2) or removable and writable (3), and the LL indicates the error count (in hexadecimal) for the drive. The P indicates the last command on the SCSI bus, the R indicates the status of the drive, and the S indicates the results of the routine test on the drive. Table F–12 lists the last command codes (P). Table F–13 lists the codes for drive status (R). Table F–11 lists the error codes for the routine status (S).

Table F–11 SCSI Bus Controller Error Codes (0U00.XYZ1) (0000.00S1)

Error Codes	Definition
0	Success—No error
1	Controller error:
	DMA bit will not set in TPC controller MODE register.
	Target command register is not valid.
	Initiator command register is not valid.
	Bus free is not valid.
	Phase Match bit in bus and status register is not valid.
	Interrupt Request bit in bus and status register is not valid.
2	Data path error:
	Data path in longword, word, or byte access failed.
	Unable to access data all of data buffer.
	Unable to reach TPC controller, and unable to write to mode register.
3	DMA count error:
	Count register is not verified.
	Count is not 0 after DMA transfer.
4	Timout error:

Table F–11 (Cont.) SCSI Bus Controller Error Codes (0U00.XYZ1) (0000.00S1)

Error Codes	Definition
	No phase match within timeout period.
5	Interrupt error:
	Interrupt is not received when expected.
	An error occurred while testing the system interrupt logic.
6	Unexpected interrupt error:
	Unexpected interrupt received.
7	Command error:
	Request SENCE command ended without sence data.
	Command terminated with bad device status.
8	Phase error:
	Unexpected phase, or phase change on the SCSI bus.
9	Buffer overflow error:
	Too many bytes read from target.
A	Arbitration error:
	AIP bit in initiator command register not set during arbitration process or arbitration lost during arbitration process or arbitration not won.
B	Target will not set BSY during selection process, the controller is busy at start of register test, or the INI_CMD(BSY) bit did not toggle during the register test.
C	Unable to loop data out onto SCSI bus and back in again.
D	Direction and phase of SCSI bus as set by the target and read from the controller are incompatible.
E	SCSI bus does not drop REQ within timeout period or SCSI bus does not assert REQ within timeout period.
F	DMAEnd bit not verified in bus and status register or DMA data not matching expected data.

Table F–12 Last Command on the SCSI Bus Codes (0000.P001)

Code	Last Command
0	Com$unitready
1	Com$requestsence
2	Com$inquiry
3	Com$senddiagnostics
4	Com$recdiagnostics
5	Com$read
6	Com$write
7	Com$rewind
8	Com$filemark
9	Com$mode_sense

Table F–13 Drive Status Codes (0000.0R01)

Status Codes	Definition
0	Ready - Drive is on-line and ready for commands.
2	Off-line - Status given to devices that will not respond to selection process or status given to all devices for initialization.
4	Not ready - Status given to devices that are selectable, but return a not ready status during status phase of a command (command tried five times).
6	Diagnostic error - Device returned an error status after a self-test.
8	Key error - Unable to rewrite Field Service key on removable media sequential device.

F.6 8-Plane Graphics Option (8PLN)

Error code format: 00XX.ZZZZ

Where XX indicates the test number (20 or 21 for status message, ignore XX for hard errors) and ZZZZ indicate the error codes. Table F–14 lists the error codes.

Table F–14 8-Plane Graphics Option Error Codes (0000.ZZZZ)

Error Code	Failing Test	Error Code	Failing Test
0001	No error	0013	Transfer display list command
0002	Program initialization	0014	Display list commands
0003	FCC RAM	0015	Interrupts
0004	FCC FIFO control	xx16	Cursor - Ignore xx field
0005	Dragon initialization	0017	VDAC read/write
0006	Dragon timing chip	0018	Scrolling
0007	Video memory	0019	Scrolling (burst mode)
0008	ID bus data path	0020	Video readback
0009	FCC data transfers	0021	Cursor readback
0010	Byte packing	0022	Left edge readback
0011	Byte packing (burst mode)	0023	Right edge readback
0012	Compression	0024	Sync readback

F.7 Ethernet Network (NI)

Error code format: 000X.ZZZZ

Where X indicates the test number and ZZZZ indicates the error code. Table F–15 lists the test numbers and the type of tests done. Table F–16 lists the error codes that can occur on any test.

Table F–15 Ethernet Test Numbers (000X.0000)

Test Numbers	Definition
1	Initialization and check for interrupt
2	Internal loopback (with interrupt)
3	Check that the computed CRC is accepted and the incorrect CRC is rejected
4	Multicast addressing and promiscuous receive
5, 6	Force collision, miss errors
7	External loopback (with interrupt)

Table F–16 Ethernet Error Codes (000X.ZZZZ)

Error Codes	Definition
0001	Success—no error
0002	No_packet_received
0004	Packet_miscompare
0006	Wrong_received_crc
0008	Initialization_failed
000A	Received_packet_with_bad_crc
000C	Crc_flag_not_set_when_forced
000E	Received_illegal_multicast
0010	Rejected_packet_in_prom_mode
0012	Rejected_legal_multicast
0014	Rtry_not_set_when_forced
0016	Buff_not_set_when_forced
0018	Miss_not_set_when_forced
001A	Transmit_error
001C	Transmit_timeout

G
Diagnostic LED Definitions

This appendix defines the eight LEDs on the back of the system box during each phase of the testing and power-up initialization. The LEDs are divided into two fields. The first four LEDs indicate the current state of the system and the second set of four depend on the previous four.

There are 16 possible combinations for each set of LEDs. The 4 LEDs that indicate the state of the system have the following definitions. The other four LEDs have another meaning as indicated in Table G–1. The number 1 indicates the LED is lit.

Table G–1 Diagnostic LEDs Definitions

State	Substate	Definitions	Recommendations
1111	1111	Power is applied but no instruction is executed.	See Section G.1
1111	0000	Power is applied. The ROM code is successfully started and several instructions have been executed.	See Section G.1
1110	0000	Console memory sizing routine is entered. Memory to hold the console data structures is located. The substate variables have no meaning in this section of the test.	See Section G.1
1101	0000	The console data structures are initialized and have started testing the NVR.	See Section G.1
1100	0000	The NVR test completed and the DZ test has started.	See Section G.1
1011	0000	The DZ test completes. An optional video has been found but its testing has not been started. This is part of the console determination code.	See Section G.1

Table G–1 (Cont.) Diagnostic LEDs Definitions

State	Substate	Definitions	Recommendations
1011	0001	The DZ test completes. No optional video is installed or, if it is installed, fails self-test. In either case, the base monochrome video test has been entered.	See Section G.1
1010	0000	The video subsystem was tested and the console initialization sequence was entered.	See Section G.1
1001	xxxx[1]	The system initializes and power-up testing starts. The substate variable indicates the test being executed.	If the substate contains any lit LEDs, determine the failing device. If you have operational video, troubleshoot that device. If the video screen is blank, dead system. (Section G.1).
1000	xxxx[1]	The self-test completes with the substate indicating the failing subsystem.	Enter **TEST 50** to see the results.
0111	xxxx[1]	Self-test was entered from the console TEST command. The substate indicates the test currently being executed.	Enter **TEST 50** to see the results.
0110	xxxx[1]	The self-test completes from the TEST command with the substate indicating the failing subsystem.	Enter **TEST 50** to see the results.
0101	xxxx[1]	The self-test started under control of the APT system. The substate indicates the test currently being executed.	Enter **TEST 50** to see the results.
0100	xxxx[1]	The system exerciser started from a console TEST command. The substate indicates the value of the lower four bits of the command. If the system exerciser starts with a T 101, the substate contains a 1 (hexadecimal).	Read the test results on the screen. Troubleshoot the failing device.

[1] 1111 = MONO, 1110 = CLK, 1101 = NVR, 1100 = DZ, 1011 = MEM, 1010 = MM, 1001 = FP, 1000 = IT, 0111 = STRG-1 or SCSI-A, 0110 = SCSI-A or SCSI-B, 0101 = SYS, 0100 = 8PLN, 0011 = (option), 0010 = (option), 0001 = NI

Table G–1 (Cont.) Diagnostic LEDs Definitions

State	Substate	Definitions	Recommendations
0011	0000	The system exerciser started under control of the APT test delivery system.	Read the test results on the screen. Troubleshoot the failing device.
0010	xxxx[1]	The entity-based module received a request from a host to enter monitor mode. This lets the host send commands to the system. This is indicated if the functionality of the EBM is implemented at a later release of the system ROM.	Reserved for future use.
0001	xxxx[1]	Console mode was successfully entered and is ready to accept commands. This does not apply to power on. The substate indicates the failing subsystem if there is one. This differs from a self-test complete, because the console can be entered by other means.	This code indicates that the console was entered from something other than a TEST command or power on halt, such as the HALT button.
0000	xxxx	Attempting to boot the system. Once control passes to VMB, the state LEDs have no meaning.	System is booting.

[1] 1111 = MONO, 1110 = CLK, 1101 = NVR, 1100 = DZ, 1011 = MEM, 1010 = MM, 1001 = FP, 1000 = IT, 0111 = STRG-1 or SCSI-A, 0110 = SCSI-A or SCSI-B, 0101 = SYS, 0100 = 8PLN, 0011 = (option), 0010 = (option), 0001 = NI

Figure G–1 shows the LEDs on the back of the system box.

Figure G–1 LED Layout

G.1 Additional LED Information

When the system does not power up successfully or if the diagnostics find an error, the eight LEDs on the back of the system box usually indicate the failing device (the system takes 2 to 5 minutes to complete power-up initialization and testing). However, if the four state LEDs indicate 1111 (F in hexadecimal) through 1010 (A in hexadecimal), the substate LEDs offer no help in determining the failing FRU. You must disconnect an FRU as

described in each step in the following procedure until the system does power up normally. Once the system does power-up normally, the last FRU you disconnected is the failing FRU. Replace the failing FRU and retest the system for any further problems.

1. Power down the system. Remove the system box cover, disconnect the cable connecting the system module to the MSC module, and disconnect the power cables to the drives. This disconnects the MSC module and all of the drives from the system.

2. Power up the system with the MSC module disconnected. If the system still does not power up properly, the problem is not with the drives or the MSC module, proceed to step 3. If the system does power up successfully after disconnecting the MSC module, replace the MSC module and retest the system.

3. Power down the system, remove drive mounting panel(s) from the system, and remove the graphics module from the system module. If the graphics module was not installed, proceed to step 5. When you power up the system after removing the graphics module, you must either connect an alternate console terminal to the printer port and set S3 to the up position (9600 baud rate) or watch the LEDs to see if the system does or does not power up successfully. The alternate console is used to display the video because there is no video signal output to the monitor when the graphics module is disconnected.

4. Power up the system with the graphics module disconnected. If the system still does not power up properly, the problem is not in the graphics module, proceed to step 5. If the system does power up successfully, replace the graphics module and retest the system.

5. Power down the system, remove the memory module from the system module.

6. Power up the system with the memory module disconnected. If the system does not power up properly, the problem is not the memory module, proceed to step 7. If the system does power up successfully, replace the memory module and retest the system.

7. Power down the system. Replace the system module and power up the system again. If the system still does not power up properly after replacing the system module, replace the power supply.

H

Recommended Spares List

Part Number	Description	Quantity
	VAXstation 3100 FRUs (FRUs common to all models)	
54-17312-01	VS 3100 system module (KA42-A)	1
54-18287-AA	4 Mbyte memory module (MS42-AA)	1
54-19051-AA	4 Mbyte memory module (MS42-AB)	1
54-18287-BA	12 Mbyte memory module (MS42-BA)	1
54-18324-AA	16 Mbyte memory module (MS42-CA)	1
54-17445-04	SCSI/SCSI MSC module (VS42X-RC)	1
54-16888-01	4-plane graphics co-processor module (VS40X-MA)	1
54-17282-01	8-plane graphics co-processor module (VS40X-PA)	1
RZ22-E	52 Mbyte SCSI disk drive with logic module	1
RZ23-E	104 Mbyte SCSI disk drive with logic module	1
29-27240-01	RZ22/RZ23 module/frame assembly	1
TZ30-AX	TZ30 95 Mbyte tape drive	1
17-02223-01	Internal MSC cable (from system module)	1
12-19245-00	5 Vdc battery pack	1
	VAXstation 3100 FRUs (FRUs for model 30 systems only)	
H7821	Power supply	1
54-17314-02	ST506/SCSI MSC module (VS42X-RA)	1
RX23-AA	RX23 diskette drive	1

Part Number	Description	Quantity
17-02221-01	Internal RX23 data cable	1
17-02220-02	Internal power cable	1
17-02257-01	Dual RZ23 drive data cable	1
17-02212-01	Internal SCSI data cable	1
17-02212-02	Internal SCSI data cable	1
	VAXstation 3100 FRUs (FRUs for model 40 systems only)	
H7822	Power supply	1
17-02232-01	Dual device SCSI cable	1
17-02231-01	Triple device SCSI cable	1
17-02225-01	Mass storage power cable (lower drives)	1
17-02219-01	Mass storage power cable (upper drives)	1
RRD40-AA	RRD40 compact disc drive with adapter board	1
	VAXstation 3100 (loopbacks, terminators, and external cables)	
17-01992-01	BC23J-03 color monitor cable (short)	1
17-01993-01	BC23K monochrome monitor cable (short)	1
17-01480-01	BC19S color monitor cable (long)	1
17-00568-01	BC18P monochrome monitor cable (long)	1
17-00606-02	System power cord (USA)	1
17-00442-26	System to monitor power cord	1
17-02008-01	68 pin to 50 pin external SCSI port cable	1
17-01351-01	50 pin to 50 pin SCSI cable	1
17-01351-04	50 pin SCSI cable (18 inches)	1
12-22196-01	Standard Ethernet loopback	1
12-25869-01	ThinWire Ethernet T-connector	1
12-26318-01	ThinWire Ethernet cable 50-ohm terminator	2
12-25083-01	MMJ loopback connector (H3103)	2
12-29635-01	68 pin external SCSI port terminator	1

Part Number	Description	Quantity
12-30552-01	50 pin SCSI terminator (expansion box)	1
17-00811-03	BC16E-25 DECconnect office cable (25 feet)	2
17-00811-04	BC16E-50 DECconnect office cable (50 feet)	1
	RZ55 Disk Expansion Box FRUs	
54-19325-01	SCSI ID switch board	1
17-02299-01	SCSI ID switch cable	1
17-00342-01	Internal power supply extension cable	1
17-01249-01	Internal data cable	1
17-01090-01	Internal data cable	1
17-00342-01	Internal power supply extension cable	1
H7848-BA	Power supply (120 Vac)	1
H7848-AB	Power supply (240 Vac)	1
54-17163-01	Resistor load board	1
17-00606-02	Power cord (USA)	1
RZ55-E	RZ55 disk drive	1
29-27347-01	RZ55 logic module	1
	TK50Z-GA Tape Expansion Box FRUs	
54-19325-01	SCSI ID switch board	1
17-02299-01	SCSI ID switch cable	1
17-01247-02	Internal I/O cable (TK50 to TZK50)	1
17-01249-01	Internal data cable (TZK50 to external connector)	1
17-01397-01	Internal load board power extension cable	1
17-00342-01	Internal power supply extension cable	1
H7848-BA	Power supply (120 Vac)	1
H7848-AB	Power supply (240 Vac)	1
54-17163-01	Resistor load board	1
17-00606-02	Power cord (USA)	1

Part Number	Description	Quantity
TK50-AX	TK50 tape drive	1
54-17639-01	TZK50 controller board (TZK50-AA)	1
	RRD40 Compact Disc Expansion Box FRUs	
RRD40-DA	RRD40 compact disc expansion box (w/SCSI interface)	1
	Miscellaneous Parts	
LK301-A	Keyboard (USA keycaps)	1
LK302-A	Keyboard (WPS keycaps)	1
17-01480-01	VSXXX-AA mouse	1
29-25997-00	Tablet assembly	1
30-23507-03	RRD40 test disc	1
29-27338-01	RRD40 empty caddy	1
30-20515-01	TK50 blank media	1
30-25145-05	RX23 blank media	1
29-25995-00	Stylus	1
29-25996-00	Puck	1
29-25992-00	Mouse ball	1
29-25993-00	Mouse door	1
A2-M1329-10	Color maintenance kit (two 75-ohm terminators 29-26899-00)	1
12-23599-01	25 pin passive adapter (H8571-A)	1

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